Connect Tech

BOARD SUPPORT PACKAGE

For Connect Tech NVIDIA® Jetson ORIN-NX-NANO-RT Carriers

BSP Version: ORIN-NX-NANO-RT-36.4.4 V005
Last Updated: 2025/12/22

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 9 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 20.04 or 22.04
- JetPack 6.2.1 / L4T 36.4.4 installed (see Section 4)
- Orin™ NX or Orin™ Nano module
- Connect Tech Orin™ NX/Orin™ Nano Carrier
- USB Cable for flashing

*L4T version can be found in /etc/nv_tegra_release and will look like this:
R36 (release), REVISION: 4.4

3. BSP Features

3.1 Product Specific Details

NGX003 (Photon)

- USB 3.0 Support
- USB OTG Supported in device mode.
- HDMI Support
- Micro SD Card Not Supported on Orin™ NX/Orin™ Nano
- NVMe Card Support
- PoE Support
- Wifi/Bluetooth Card Not Supported on Orin™ NX/Orin™ Nano
    - 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
- MIPI camera support

Supported Mipi Cameras:

- Raspberry Pi IMX219
- ArduCAM IMX477
- Vision Components IMX296
- Allied Vision Alvium MIPI CSI-2 Sensors
- BASLER daA2500-60mci and daA4200-30mci mipi cameras

NGX007 (Boson)

- USB 3.0 Support
- USB OTG Support
- Display(HDMI)
- Micro SD Card Not Supported on Orin™ NX/Orin™ Nano
- GbE Phy Support
- CAN Support
- UART Support
- SPI Support
- I2C Support
- PWM Support
- Wifi/Bluetooth Support
- NVMe Card Support
- Framos Camera support
    - Note that CAM4 is disabled as CSI4 is unsupported on Orin™ NX/Orin™ Nano

Supported Framos Cameras:

- FSM-IMX296 (3-Cam only)
- FSM-IMX415
- FSM-IMX462

- FSM-IMX464
- FSM-IMX565
- FSM-IMX568
- FSM-IMX585
- FSM-IMX662
- FSM-IMX676
- FSM-IMX678
- FSM-IMX715

*Note we may eventually phase out camera integration for NGX007 for Orin-nx/nano. Camera support is available upon request.

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

Supported GMSL Cameras:

- Tier4 C1 (ISX021)
- Tier4 C2 (IMX490)
- Tier4 C3 (IMX728)
- Stereolabs ZEDX
- Stereolabs ZEDX One GS
- Stereolabs ZEDX One 4k*
- Econ SturdeCAM20
- D3 AR0234
- D3 IMX390
- D3 ISX031
- Allied Vision Alvium GMSL Sensors
- Leopard IMX390

*Note ZEDX One 4k cameras do not function with ZED SDK installed

NGX012 (Hadron)

- USB 3.0 Support
- USB OTG Support
- GbE Phy Support
- NVMe Card Support
- Wifi/Bluetooth support
- CAN Support
- UART Support
- I2C Support
- GPIO Support
- SPI Support
- PWM Support
- MIPI camera support

Supported MIPI Cameras:

- ArduCAM IMX477
- Raspberry PI IMX219
- Vision Components IMX296
- Allied Vision Alvium MIPI CSI-2 Sensors
- BASLER daA2500-60mci and daA4200-30mci mipi cameras
- Framos FSM-IMX662
- Framos FSM-IMX678

NGX015 (Polaris)

- USB 3.0 Support
- USB OTG Support
- GbE Phy Support
- NVMe Card Support
- Wifi/Bluetooth support
- CAN Support
- M12 GBE sensor support
- M.2 B-Key modem support
- Wake on LAN Currently Not Supported
- Wake on gpio expander Currently Not Supported
- 2x fan and tach support
- Pressure/Temp sensor support
- BMS Support (for reading battery voltage)
- M12 Isolated I/O support
- GMSL Camera Support

Supported GMSL Cameras:

- Tier4 C1 (ISX021)
- Tier4 C2 (IMX490)
- Tier4 C3 (IMX728)

- Stereolabs ZEDX
- Econ SturdeCAM20
- Econ NileCAM21
- Allied Vision Alvium GMSL Sensors

NGX018 (Hadron GMSL)

- USB 3.0 Support
- USB OTG Support
- GbE Phy Support
- NVMe Card Support
- Wifi/Bluetooth support
- CAN Support
- UART Support
- I2C Support
- GPIO Support
- PWM Support
- GMSL Camera Support

Supported GMSL Cameras:

- Tier4 C1 (ISX021)
- Tier4 C2 (IMX490)
- Tier4 C3 (IMX728)
- Leopard IMX390
- Stereolabs ZEDX
- Stereolabs ZEDX One GS
- Stereolabs ZEDX One 4k*
- Econ SturdeCAM20
- FSM-IMX568
- D3 AR0234
- D3 IMX390
- D3 ISX031
- Allied Vision Alvium GMSL Sensors

*Note ZEDX One 4k cameras do not function with ZED SDK installed

NGX020 (Boson for Orin)

- USB 3.0 Support
- USB OTG Support
- Display(HDMI)
- GbE Phy Support
- CAN Support
- UART Support
- SPI Support

- I2C Support
- PWM Support
- Wifi/Bluetooth Support
- NVMe Card Support
- Framos Camera Support

Supported Framos Cameras:

- FSM-IMX296 (4-Cam only)
- FSM-IMX415
- FSM-IMX462
- FSM-IMX464
- FSM-IMX565
- FSM-IMX568
- FSM-IMX585
- FSM-IMX662
- FSM-IMX676
- FSM-IMX678
- FSM-IMX715

NGX021 (Boson22 for Orin)

- USB 3.0 Support
- USB OTG Support
- Display(HDMI)
- GbE Phy Support
- CAN Support
- UART Support
- SPI Support
- I2C Support
- PWM Support
- Wifi/Bluetooth Support
- NVMe Card Support
- 22-pin CSI camera connector Support
- MIPI camera support

Supported MIPI Cameras:

- ArduCAM IMX477
- Raspberry PI IMX219
- Vision Components IMX296
- Allied Vision Alvium MIPI CSI-2 Sensors
- BASLER daA2500-60mci and daA4200-30mci mipi cameras

NGX022 (Lepton FPDLink III)

- USB 3.0 Support

- USB OTG Support
- Display(HDMI)
- GbE Phy Support
- CAN Support
- UART Support
- SPI Support
- I2C Support
- PWM Support
- Wifi/Bluetooth Support
- NVMe Card Support
- FPDLINK III Camera Support
- External Trigger Support

Supported Cameras:

- Econ NeduCAM25
- Allied Vision Alvium FPD-Link III Sensors

NGX024 (Hadron Dual Mipi)

- USB 3.0 Support
- USB OTG Support
- GbE Phy Support
- NVMe Card Support
- Wifi/Bluetooth support
- CAN Support
- UART Support
- I2C Support
- GPIO Support
- SPI Support
- PWM Support
- x2 MIPI camera support

Supported MIPI Cameras:

- ArduCAM IMX477
- Raspberry PI IMX219
- Vision Components IMX296
- Allied Vision Alvium MIPI CSI-2 Sensors
- BASLER daA2500-60mci and daA4200-30mci mipi cameras
- Framos FSM-IMX662
- Framos FSM-IMX678

NGX026/CORE03/CORE04 (Essential-EdgeAI)

- 1G ethernet Support.

- NVMe Card Support.
- USB OTG Support.
- Debug UART Support.

NGX027 (Super Hadron DM)

- USB 3.0 Support
- USB OTG Support
- GbE Phy Support
- NVMe Card Support
- Wifi/Bluetooth support
- CAN Support
- UART Support
- I2C Support
- GPIO Support
- SPI Support
- PWM Support
- x2 MIPI camera support

Supported MIPI Cameras:

- ArduCAM IMX477
- Raspberry PI IMX219
- Vision Components IMX296
- Allied Vision Alvium MIPI CSI-2 Sensors
- BASLER daA2500-60mci and daA4200-30mci mipi cameras
- Framos FSM-IMX662
- Framos FSM-IMX678

*Note uses NGX024 Hadron Dual Mipi Software config

NGX926 (Uses)

- 1G ethernet Support.
- NVMe Card Support.
- USB OTG Support.
- Debug UART Support.

3.1.1 Installing ZED X camera SDK

The ZED SDK is recommended to operate the ZED X stereo camera, and the ZED X One GS camera. It should not be installed with the ZED X One 4k camera, as significant issues were observed (see section 3.2). To use the SDK, Nvidia's CUDA, along with a few other dependencies, must first be installed (It is not installed automatically with this BSP).

To install these dependencies, run this command:
"sudo apt install zstd libqt5network5 libqt5opengl5 libqt5sql5 libqt5xml5 cuda"

The ZED SDK can then be downloaded onto your Jetson from the Stereolabs website here:
https://www.stereolabs.com/developers/release/

Click on "SDK Download", then the link for "ZED SDK for JetPack 6.1 and 6.2 (L4T 36.4)".
Note: ZED X drivers are already included in this BSP and do not need to be downloaded.

Once you have downloaded the executable onto your Jetson system, follow the rest of the instructions under "Download and Install the ZED SDK" at this link:
https://www.stereolabs.com/docs/installation/jetson/

Additional questions about the SDK and camera applications can be answered by Stereolabs at https://support.stereolabs.com/hc/en-us/

3.1.2 Tier4 C1 Camera Info

Tier4 C1 cameras require you load the camera firmware into the initrd before attaching any cameras. Failing to do so may result in a critical exception on boot.

Boot the device after flashing without the C1 cameras connected.

In a terminal install the C1 camera firmware using the following command:
cti-tier4-firmware.sh /boot/initrd tier4-isx021.bin
sync

After the firmware has installed, turn your carrier off, attach the C1 cameras and turn the system back on. After the system is on you should be able to stream your C1 cameras.

3.1.3 Tier4 C2 Camera Info

It is recommended to use super mode when running c2 on an Orin™ NX/Orin™ Nano device.

Note that the Following trigger modes have been verified for Orin-NX/Orin-NANO:

Mode	Index
MASTER_MODE_10FPS	0
MASTER_MODE_20FPS	2
MASTER_MODE_30FPS	4
SLAVE_MODE_30FPS	5

The default is set as MASTER_MODE_30FPS, but you can set the trigger mode at runtime through the filesystem:
echo <n> > /sys/module/tier4_imx490/parameters/trigger_mode
where n is the Index shown in the table above.

3.1.4 Tier4 C3 Camera Info

It is recommended to use super mode when running c3 on an Orin™ NX/Orin™ Nano device.

Note that the Following trigger modes have been verified for Orin-NX/Orin-NANO:

Mode	Index
MASTER_MODE_10FPS	0
MASTER_MODE_20FPS	2
SLAVE_MODE_20FPS	3

The default is set as MASTER_MODE_20FPS, but you can set the trigger mode at runtime through the filesystem:
echo <n> > /sys/module/tier4_imx728/parameters/trigger_mode
where n is the Index shown in the table above.

3.1.5 Installing Pylon SDK (For Basler)

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

https://www.baslerweb.com/en/downloads/software/?downloadCategory.values.label.data=Embedded+Software

Download the "Camera Enablement Package for NVIDIA® Boards & Raspberry Pi 4.1.0" package onto your Jetson, and untar it:
tar xf basler-dart-bcon-mipi-cep_4.1.tar.gz

Next install dependancies with the following commands:
sudo apt-get update
sudo apt-get install libxcb-xinerama0 libxcb-xinput0 libxcb-cursor0 -y

Once those are installed, cd into the basler-dart-bcon-mipi-cep_4.1 directory you untarred, and install the camera binaries:
sudo apt-get install ./basler-daa*3.3.0-0_arm64.deb -y

Finally you can install the pylon API:
sudo apt-get install ./pylon_25.06.4-deb0_arm64.deb -y

Further information can be found in the README.md included in basler-dart-bcon-mipi-cep_4.1, under the sections "Using the Camera" and "Installing pypylon" (Including links to further documentation). The other sections of the README.md file are specific to Nvidia's Jetson development kit/Rasberry Pi, and do not apply to this BSP.

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/

3.2 Limitations and Known Issues

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

2. Camera Port 4 on the Boson Carrier designed for Xavier™ NX (NGX007) will not work with Orin™ NX or Orin™ Nano as they do not support CSI_4. Therefore only 2 camera 4-lane and 3 camera 2-lane configurations are provided.

A new carrier design "Boson for Orin (NGX020)" reroutes the csi lanes to stream on 4 ports. 4 camera 2-lane and 2 camera 4-lane configurations for the NGX020.

3. Suspend/Wake functionality causes system error on boot, and should not be enabled.

4. An error occurs when connecting the Polaris (NGX015) as a USB device through the OTG USB port, and then disconnecting and hotplugging a USB device into the OTG port, where the USB device does not register on the Polaris. Disconnecting and then reconnecting the USB device will cause the Polaris to correctly detect it.

5. Running the ZEDx API headless cannot be validated at this time. When running using A virtual desktop, ZEDx cameras appear to detect on NGX010 and NGX015 in the ZEDx API before throwing an unsupported resolution error. Cameras on NGX018 (Hadron-GMSL) also fail to detect altogether in the ZEDX API. Using a display when using the ZEDX API for NGX015 and NGX018 does work. As a headless only system, Hadron-GMSL has currently only been validated using v4l2 and argus.

6. Framos camera device trees include camera modes that support different sensor variants (i.e. monochrome vs. color) and therefore not all modes may work for your particular sensor variant. Streaming apis/programs may default to an unsupported mode. If you notice the default camera mode is not streaming, please select another mode.

7. With the Framos GMSL cameras, you must set the data_rate v4l2 control to 891mbps or

594mbps.
i.e. v4l2-ctl -d /dev/videoX -c data_rate=1 # set 891mbs data_rate

8. Hadron GMSL requires to unset display for argus to stream.
i.e. unset DISPLAY

9. The ZEDx API fails to detect the ZED X One 4k (Ultra High Definition) cameras. Moreover, previously verified gstreamer pipelines failed to launch after installation of the ZED SDK. For this reason, it is recommended not to install the SDK on systems using the ZED X One 4k cameras.

10. Lepton currently does not support using VimbaX with the Allied Vision config. We will investigate adding this support into a future release. For now, the avt-csi2-4cam config has been verified to work using gstreamer and v4l2.

4. Installation

4.1 Obtaining NVIDIA® Jetpack

Before Installing the BSP you will need to install JetPack 6.2.1 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-r3644

3. Download the "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_R36.4.4_aarch64.tbz2

- Tegra_Linux_Sample-Root-Filesystem_R36.4.4_aarch64.tbz2

5. Extract the "L4T Driver Package" tarball:

cd <BSP_ROOT>
sudo tar -jxf Jetson_Linux_R36.4.4_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_R36.4.4_aarch64.tbz2

4.2 CTI BSP Installation

1. Copy the CTI-L4T-ORIN-NX-NANO-36.4.4-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-36.4.4-V###.tgz <BSP_ROOT>/Linux_for_Tegra

2. Extract the BSP: tar -xzf CTI-L4T-ORIN-NX-NANO-36.4.4-V###.tgz
cd <BSP_ROOT>/Linux_for_Tegra
sudo tar -xzf CTI-L4T-ORIN-NX-NANO-36.4.3-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 (standard mode):
./cti-nvme-flash.sh cti/<module>/<boardname>/<config>

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

Manual Flash (super mode):
SUPER_MODE=1 ./cti-nvme-flash.sh cti/<module>/<boardname>/<config>

Examples:
./cti-nvme-flash.sh cti/orin-nx/boson/base
./cti-nvme-flash.sh cti/orin-nano/boson/base
SUPER_MODE=1 ./cti-nvme-flash.sh cti/orin-nx/hadron/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/Orin™ Nano

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
This script does not support switching to super mode. When board is flashed into super mode, this script cannot switch back to normal mode the module needs to be reflashed.

8. Using the Jetson's Internal TPM

Starting in 36.4.4, NVIDIA® has added a tpm provisioning service that manually probes the tpm_ftpm_tee driver and sets up the Jetson's internal tpm at /dev/tpm0.

Since we have some carriers with external tpms, we opted to disable these services (nv-ftpm-device-provision.service and nv-tee-supplicant.service) by default.

If you wish to use the native TPM, CTI has provided a simple script that will load these services and reboot the device so that the changes take effect:

/etc/systemd/cti-enable-nv-tpm.sh

This script will prompt you when being run:

TPM Provision service will be setup and the system will reboot.
After reboot the tpm on the module should be available at /dev/tpm0.
It has been observed on Orin™ NX/Orin™ Nano that if you flash two modules run these services and then swap
the NVMes between them that the tpm driver will fail it's probe on boot, so /dev/tpm0 will not be present.
A dependency appears to form with the original boot device.
Note that it is not recommended to run this script if you are using a carrier with an external TPM.
Would you like to continue? Yy/Nn:

You can skip this prompt by adding -y when you run cti-enable-nv-tpm.sh:

/etc/systemd/cti-enable-nv-tpm.sh -y

Note that if the script detects that the nv-ftpm-device-provision.service and nv-tee-supplicant.service services are already registered, it will exit the program:

nv-ftpm-device-provision.service and nv-tee-supplicant.service appear already loaded!
They were found in /etc/systemd/system/sysinit.target.wants/!
These services should already be running on boot!
If the link files have been modified or corrupted, remove them to rerun this script.
Exiting...

9. Change Log

Version ORIN-NX-NANO-36.4.4 V005, December 25, 2025

- Fixed a kernel panic in some cases when stopping and starting streams with multiple cameras
- Applied PREEMPT_RT kernel patches

Version ORIN-NX-NANO-36.4.4 V004, November 25, 2025

- Switched UEFI release to uefi-202412.0-updates, to fix the USB3 linking issues on OTG ports when having a device connected on boot.
- Disabled optee/tpm services by default so that the tpm_ftpm_tee driver does not probe and create a tpm file at /dev/tpm0. This is relevant as we have carriers with external TPMs (see section 8).

Version ORIN-NX-NANO-36.4.4 V003, November 14, 2025

- Added support for Framos FSM-IMX678 on NGX012 and NGX024/NGX027

Version ORIN-NX-NANO-36.4.4 V002, November 3, 2025

- Added support for Basler MIPI cameras
- Fixed intermittent flashing and OTG issue on NGX020 and NGX021

Version ORIN-NX-NANO-36.4.4 V001, September 4, 2025

- Initial release of Jetpack 6.2.1 (l4t 36.4.4) for Orin™ NX/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 Connect Tech Resource Center for product manuals, installation guides, device drivers, BSPs and technical tips. 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.
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