TEGRA LINUX DRIVER PACKAGE R24.2.1

Release Notes

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1.0 ABOUT THIS RELEASE

The NVIDIA® Tegra® Linux Driver Package supports development of platforms running the NVIDIA® Tegra® X1 series computer-on-a-chip.

> 💬 **Note: This release of Tegra Linux Driver Package R24.2.1 is a release for the NVIDIA® Jetson™ Developer Kit (P2371-2180).**

Release Information

The following table describes attributes of this product release. When you encounter these variables, in these *Release Notes* or in the *Developer Guide,* use the provided value in place of the variable.

Variable	Value	Description
<os_ver_host>	14.04 (amd64 distribution)	Specifies the host Ubuntu operating system version.
<os_ver_target>	16.04 (arm64 distribution)	Specifies the target (rootfs) Ubuntu operating system version.
<lnx_ver>	3.10.96	Specifies the version of the Linux kernel.
<tag_name>	tegra-l4t-r24.2.1	Specifies the Git tag for the release.
<release>	R24.2.1	Specifies the release.
<release_num>	24.2.1	Specifies the complete release number for use in file and path names.
<release_type>	aarch64	Specifies the supported ARM architecture.
<EGL|GL_ver>	362.24.18.0	Specifies the EGL or OpenGL version.

Platform Information

The following table describes attributes of the Jetson TX1 platform.

Variable	Value	Description
<platform|ver>	t210ref	Specifies the platform.
<board_and_rev>	jetson-tx1	Specifies the board and revision. This information is used in flashing and paths.
<t-arch>	210	Specifies the Tegra SoC on the platform.

1.1 WHAT'S NEW

▶ `libargus` is now multi-process by default, verified two 5MP Ov5693 sensors at 30fps.
▶ New metadata and controls to support application layer AE and AWB as well as working sample applications.
▶ Input image is correctly scaled to compensate for black-level correction if lens shading is disabled.
▶ Implemented fixes for camera stability and performance.

See "Software Features" in the *Tegra Linux Driver Package Developer Guide* for more information about the features of this release.

For a complete list of kernel changes in this release see the following website:

```
http://nv-tegra.nvidia.com/gitweb/?p=linux-
3.10.git;a=shortlog;h=refs/heads/l4t/l4t-r24.2
```

1.2 LOGIN CREDENTIALS

The default login credentials are:

▶ Username: `ubuntu`
▶ Password: `ubuntu`

The release also includes the following credentials:

▶ Username: `nvidia`
▶ Password: `nvidia`

1.3 SOURCES FOR INCLUDED LINUX DISTRIBUTION PACKAGES

Visit the Jetson Embedded Platform website for source code provided subject to the terms of open source licenses that require source code availability, such as the GNU General Public License.

1.4 TOP ISSUES FIXED SINCE LAST RELEASE

The following issues are resolved in this release.

- ▶ [1794670] HDMI audio output device is not listed in system settings application
- ▶ [200232592] Graphics Debugger is unable to debug CUDA graphics samples
- ▶ [1806888] VisionWorks samples cannot be successfully built with the 16.04 compiler
- ▶ [200214749] Camera preview functions correctly but errors display in logs
- ▶ [200194792] Connected Bluetooth headset audio sink shows mode as "mono"
- ▶ [200089362] EDID read is unsuccessful using read-edid package
- ▶ [200199690] CUDA sample compilation on device is unsuccessful
- ▶ [1762118] Multimedia playback and camera preview corruption may occur when using the Gstreamer eglimagesink component on 64-bit X11
- ▶ [200152749] Unhandled level 3 translation fault occurs during Bluetooth data transfer
- ▶ [200134773] System intermittently becomes non-responsive during reboot stress testing with `reboot` or `init 6`
- ▶ [200244330] Unstable exposure/flickering with `userAutoExposure` with IMX-185 sensor
- ▶ [200244295] Un-freed EGL handle while quitting `gstvideoencode` sample application
- ▶ [200239249] Preview is black and white, unresponsive, and finally becomes non-responsive with some libargus-based sample applications
- ▶ [200228912] Preview is black and white after several images are captured
- ▶ [200226718] Corruption in preview image occurs in libargus-based camera application
- ▶ [200224210] Running `argus_syncsensor` and `argus_multisensor` is unsuccessful
- ▶ [200214733] The `argus_conformance` test is unsuccessful, results in segmentation fault
- ▶ [1822082] The `argus_conformance` test is unsuccessful when performing multiple iterations
- ▶ [1821526] Stuttering and dropped frames occur when recording video with libargus-based camera application
- ▶ [1792264] SCF unit tests and libargus multi-camera tests are unsuccessful
- ▶ [1736102] Camera becomes non-responsive during stress testing
- ▶ [200247203] Linearity test is unsuccessful
- ▶ [200246779] Syncpoint errors occur when quitting nvtuner with live preview enabled
- ▶ [200228319] Live preview is tinted green with nvtuner 3.2.0e
- ▶ [200242413] "Invalid xywh" displays when using `02_video_dec_cuda` to verify the result of backend or `04_video_dec_gie`.

- [200239465] Some BBOXs detect nothing while using B02 sample to verify `result.txt` from backend or B04 sample
- [200239200] The `make` utility does not build the B04 sample
- [200233839] The video_dec_gie sample is unsuccessful with larger batch sizes
- [200227668] Arbitrary batch sizes for GIE-based samples are not supported
- [1806268] Unable to compile `11_camera_object_identification` is because Thread.o is missing
- [200240455] IMX172 camera sensor conformance test is unsuccessful

2.0 IMPLEMENTATION NOTES

2.1 NVIDIA ARGUS-DAEMON STARTUP ON FIRST BOOT IS UNSUCCESSFUL

The NVIDIA argus-daemon fails to start on the first boot of the system.

To workaround

1. After running `apply_binaries.sh`, but before flashing the target, in the following file:

    ```
    Linux_for_Tegra/rootfs/etc/systemd/system/argus-daemon.service
    ```

    change the line:

    ```
    After=network-online.target
    ```

    to:
    ```
    After=network-online.target nvfb.service
    ```

2. Boot the device normally.

    This issue only occurs on the very first boot of the target.

2.2 MULTIMEDIA API INCLUDED IN THIS RELEASE

This release includes the Multimedia API as `Tegra_Multimedia_API_R24.2.1_aarch64.tbz2`. This package can be installed with

NVIDIA® JetPack. For information about installation, see the README in the `tegra_multimedia_api` folder.

The README provides instructions about how to build the included samples. For full documentation of the Multimedia API, see the *Multimedia API Reference*, included with the *Developer Guide*.

The P3326 camera module is included with the Jetson TX1 Developer Kit for use with this API.

2.3 SOFTWARE-BASED POWER CONSUMPTION MODELING

Jetson TX1 (revision 300 or greater) enables use of INA monitors for the module and Developer Kit carrier board. Note that developer kits may have an earlier revision of the module, in which case only INA monitors related to the carrier board are available.

To monitor power consumption in software

3. Verify the version of L4T is 24.2 or higher with the following command:

```
head –1 /etc/nv_tegra_release
```

If the version of L4T is not at least 24.2, please download the latest JetPack installer from the Embedded Developer Zone website and update your Jetson TX1.

4. Verify that the Jetson TX1 module is revision 300 or higher from the module SKU with the following command:

```
sudo i2cdump –y –r 0x14-0x26 2 0x50 b
```

The feature to enable use of INA monitors is added in revision 300 and later of Jetson TX1. For example, SKU 699-82180-1000-300 has the feature.

5. Read the information from the INA3221 monitors via sysfs nodes. The naming convention for sysfs nodes is given in the following table, where <N> is a channel number 0-2.

Command	Description
rail_name_<N>	Exports the rail name.
in_current<N>_input	Exports rail current in mA.
in_voltage<N>_input	Exports rail voltage in mV.
In_power<N>_input	Exports rail power in mW.

> 💬 Note: The INA driver may also present other nodes. Do not modify any INA sysfs node value. Modifying these values could result in damage to your device.

The Jetson TX1 module has a 3-channel INA3221 monitor at I2C address 0x40. The sysfs nodes to read for rail names, voltage, current, and power are in the following directory:

```
/sys/devices/platform/7000c400.i2c/i2c-1/1-0040/iio_device/
```

The rail names for I2C address 0x40 are described in the following table:

Rail Name	Description
Channel 0: VDD_IN	Main module power input.
Channel 1: VDD_GPU	GPU power rail.
Channel 2: VDD_CPU	CPU power rail.

The Jetson TX1 Developer Kit carrier board has 3-channel INA3221 monitors at I2C addresses 0x42 and 0x43. The sysfs nodes to read rail name, voltage, current & power can be found at:

```
/sys/devices/platform/7000c400.i2c/i2c-1/1-0042/iio_device/
/sys/devices/platform/7000c400.i2c/i2c-1/1-0043/iio_device/
```

These are the rail names for I2C address 0x42:

Rail Name	Description
Channel 0: VDD_MUX	Main carrier board power input.
Channel 1: VDD_5V_IO_SYS	Main carrier board 5 V supply.
Channel 2: VDD_3V3_SYS	Main carrier board 3.3 V supply.

These are the rail names for I2C address 0x43:

Rail Name	Description
Channel 0: VDD_3V3_IO (Name on schematic is VDD_3V3_SLP)	Carrier board 3.3 V sleep supply.
Channel 1: VDD_1V8_IO (Name on schematic is VDD_1V8)	Main carrier board 1.8 V supply.
Channel 2: VDD_M2_IN (Name on schematic is VDD_3V3_SYS_M2)	3.3 V supply for M.2 Key E connector.

Examples

▶ To read INA3221 at 0x40, the channel-0 rail name (i.e., VDD_IN), use the following command:

```
cat /sys/devices/platform/7000c400.i2c/i2c-1/1-0040/iio_device/rail_name_0
```

▶ To read VDD_IN voltage, current, and power, use the following commands:

```
cat /sys/devices/platform/7000c400.i2c/i2c-1/1-0040/iio_device/in_current0_input
cat /sys/devices/platform/7000c400.i2c/i2c-1/1-0040/iio_device/in_voltage0_input
cat /sys/devices/platform/7000c400.i2c/i2c-1/1-0040/iio_device/in_power0_input
```

Use of this feature also has the following considerations:

▶ The feature enabling use of INAs was not part of the original Jetson TX1 specification. Therefore, earlier modules are not subject to RMA or automatic exchange because they lack this feature. If you need to measure module INAs, purchase the latest module.
▶ All production modules (i.e., bare modules purchased separately from a Developer Kit) are revision 400 or newer, and support use of INAs.
▶ In terms of accuracy, common practice is to assume a 10% guard band when working with INAs.
▶ For Ubuntu, the i2cdump program is part of the i2c-tools package. You can install it with commands similar to the following:

```
sudo add-apt-repository universe
sudo apt-get update
sudo apt-get install i2c-tools
```

2.4 HDMI AUDIO DEVICES IN THE AUDIO SETTINGS APPLICATION

The HDMI audio output device is not getting listed for some televisions and monitors including the following:

▶ Samsung TV 1080p LA40M81BM/XTL
▶ LG Flatron W2363D
▶ Samsung UA21ES5000RLXL
▶ LG 25UM65-p

The issue is inconsistent and sometimes occurs on subsequent reboots.

To workaround

▶ If the HDMI audio output device is not listed in audio settings, restart the pulseaudio daemon by killing the running instance as a normal user with the following command:

```
pulseaudio --kill
```

or register the systemd pulseaudio service to start the pulseaudio daemon at every boot:

```
systemctl --user enable pulseaudio.service
```

> 💬 **Note: Do not run pulseaudio as a root user.**

2.5 NEW USERS MUST BE ADDED TO VIDEO GROUP

When adding users to the system you must add them to the `video` group for the Linux desktop to appear correctly and function correctly.

2.6 SYMLINKS CHANGED BY MESA INSTALLATION

Installation of Mesa EGL may create a `/usr/lib/<arch>/libEGL.so` symlink, overwriting the symlink to the implementation library that should be used instead, `/usr/lib/<arch>/tegra-egl/libEGL.so`. This disrupts any client of EGL, including libraries in the release that use it for EGLStreams.

In this release, the symlink is replaced when the system is rebooted, fixing this issue on reboot. Similar workarounds have been applied in previous releases for other libraries such as libGL and libglx.

2.7 GSTREAMER-0.10 NOT INCLUDED

Gstreamer version 0.10 is not included in this release. Use of Gstreamer version 1.0 is required for development.

2.8 INSTALLING JETPACK ON NON-ENGLISH LANUGAGE HOST SYSTEMS

The Jetpack installer in this release does not correctly detect a 64-bit CPU (and operating system) on the host unless English is the default language.

To workaround

1. On the host system, install (or verify installation of) the English language package with the following command:

```
sudo apt-get install language-pack-en
```

2. Open `/etc/default/locale` for editing with the following command:

```
sudo nano /etc/default/locale
```

3. Comment out the language specification in /etc/default/locale and add the following:

```
LANG="en_US.UTF-8"
```

4. Reboot the host.
5. Launch Jetpack with the following command:

```
sudo ./JetPack-L4T-2.1-linux-x64.run
```

2.9 MAXIMIZING TEGRA X1 PERFORMANCE

This release includes a script (`jetson_clocks.sh`) able to maximize performance by disabling DVFS, CPU Idle, and CPU Quit. JetPack installer or the flashing script places the script in the home directory on the target at:

```
$HOME/jetson_clocks.sh
```

On the host system, the script is delivered in the TAR file at:

```
Linux_for_Tegra/nv_tegra/nv_tools.tbz2
```

For more information on power and performance management, see the following website:

```
http://elinux.org/Jetson/Performance
```

> **Note: Wait 1 minute after booting L4T to use this script, to avoid settings being overridden by the Ubuntu initialization script.**

Sample Script Usage

1. Show the current (initial) settings with the following command:

    ```
    sudo ./jetson_clocks.sh --show
    ```

2. Store the current settings with the following command:

    ```
    sudo ./jetson_clocks.sh --store
    ```

3. Maximize Jetson TX1 performance with the following command:

    ```
    sudo ./jetson_clocks.sh
    ```

4. Show the current settings with the following command:

    ```
    sudo ./jetson_clocks.sh --show
    ```

5. Restore the previous settings with the following command:

    ```
    sudo ./jetson_clocks.sh --restore
    ```

6. Show the current settings with the following command:

    ```
    sudo ./jetson_clocks.sh --show
    ```

2.10 32-BIT HARDFP SUPPORT REMOVED

The L4T R24.2.1 release only supports aarch64. The R24.1 release was the last release that the hardfp BSP for 32-bit user space support was also provided.

2.11 MEDIA CONTROLLER SUPPORT INCLUDED IN V4L2 FOR CSI CAMERA

Support for the `soc_camera` driver is disabled in the R24.2.1 release.

3.0 KNOWN ISSUES

This section provides details about issues that were discovered during development and QA but not resolved prior to this release.

In the following Known Issues tables, a check mark (✓) appearing in either the New or Past columns means:

New	Indicates issues found in this release.
Past	Indicates issues present in (and continuing to be present in) the last release.

Issue	New	Past
1. NVIDIA argus-daemon systemd service startup on first boot is unsuccessful. (See Section 2.1 of this document for workaround.) [1834549]	✓	
2. When X server is terminated (e.g., service lightdm stop), non X11 application display is unsuccessful. **To workaround** • As super user, run the following command: ```echo 0 > /sys/devices/platform/host1x/tegradc.1/graphics/fb0/blank``` [200186978]		✓

Issue	New	Past
3. Display is blank after switching to virtual terminal from desktop with Alt+Ctrl+F1-F6. **To workaround** ● As super user, run the following command: ``` echo 0 > /sys/devices/platform/host1x/tegradc.1/graphics/fb0/ blank ``` [200168814]		✓
4. NVIDIA Visual Profiler is unable to login via ssh to the target from a Windows host system. [200227653]		✓
5. Graphics Debugger is unsuccessful when loading a remote binary if the file name of the binary includes spaces. [200232589]		✓
6. The Firefox browser is not supported in this release. **To workaround** ● At the target console, enter the following command: ``` /usr/bin/chromium-browser ``` To launch a chromium based browser included in the release. You are prompted for sudo authentication the first time (and only the first time) you run `chromium-browser`, to complete its setup. [1796833]		✓
7. Error messages are displayed when running (successfully) the camera_recording sample application. [200191194]		✓
8. The libargus implementation does not support USB cameras in this release. [200206942]		✓
9. Using NFS boot, the 16.04 Ubuntu desktop does not function correctly on the target. **To workaround** ● At the target console, enter the following command: ``` sudo apt-get install --reinstall ubuntu-desktop unity compiz-core upstart ```		✓
10. Bluetooth scanning causes Audio corruption in A2DP playback. [1763058]		✓
11. Unblocking Bluetooth using rfkill (while using an NFS-based file system) causes 70006300.serial FIFO errors. [200153200]		✓
12. The device occasionally becomes non-responsive during reboot (u-boot) stress loop testing. [200165179]		✓

Issue	New	Past
13. Corruption is displayed in camera preview for USB 3.0 camera. [200143368]		✓
14. Register dump/data CRC error occurs on mmc3/mmcblk1p1 during LP switching. [200159844]		✓
15. Video files received via RTSP streaming from CSI camera sources display slight corruption and stutter. [200197840]		✓
16. Register dumps and data CRC errors are displayed on mmc2/mmcblk1p1 during LP switching. [200159844]		✓
17. The first run of the nvgscapture 1.0 test application causes errors to be displayed similar to the following: `GStreamer-WARNING **: Failed to load plugin '/usr/lib/aarch64-linux-gnu/gstreamer-1.0/libgsteglglessink.so'` The OSS version of EGL sink does not function correctly in this case. [1751872]		✓
18. The CPU hangs when using Bluetooth and an NFS file system. [200157186]		✓
19. Errors display when using rfkill to unblock Bluetooth, when also using an NFS file system. [200153200]		✓
20. Logging in to GNOME desktop (gnome-shell) is unsuccessful, accompanied by display corruption. [200196882]		✓
21. Resolution goes to 1440 x 576 at 52.1 Hz with warnings from tegra_dc upon idle timeout resume. [200175128]		✓

4.0 ABOUT EARLIER RELEASES

12 SEP 2016, 24.2

What's New

- Multimedia API
- CUDA 8.0
- Ubuntu 16.04-derived sample rootfs
- Chromium browser
- Previously deprecated features removed:
  - hardfp support
  - CSI driver
  - Gstreamer 0.10

Top Issues Fixed Since Last Release

The following issues are resolved in this release.

- [1747157] Support disabling suspend-to-ram and cpu-idle kernel configurations
- [200203807] Installing libegl1-mesa or updating the corresponding package overwrites libEGL.so.1
- [1794309] Nvcamera daemon is unsuccessful on multiple image capture runs
- [200196911] Intermittently unable to boot the kernel due to PCIe errors
- [1691314] LP switching is unsuccessful when SATA is connected to the Jetson TX1 target (firmware version 50.11).
- [1736102] Camera preview becomes non-responsive during stress testing of video/image recording
- [200122163] Disabled (DSI-0) Primary HDMI display causes the following error to display in logs: "vgaarb: this pci device is not a vga device"
- [200151236] The Camera app (NvGstPlayer-1.0) invokes an out of memory killer because of memory leak when playing multiple images in a loop

▶ [200174822] Corrupted pixels occur after the image shows up on the preview for a few minutes

11 JUN 2016, 24.1

What's New

▶ Support for 64-bit user space and runtime libraries
▶ Vulkan support
▶ V4L2 media-controller driver support for camera sensors (bypassing ISP)

Top Issues Fixed Since Last Release

The following issues are resolved in this release.

▶ [1723265] Hard resetting the TX1 board while it is above 44°C will cause boot failure due to default system shut down value is set to 44°C. The system will boot up once cooled down to below 44°C. This issue does not occur upon warm reset.
▶ [1723265] Hard resetting the TX1 board while it is above 44°C will cause boot failure due to default system shut down value is set to 44°C.
▶ [200170514] OSidle power consumption is around 185mW higher when eth0 is disabled.
▶ [1708129] GStreamer unable to set FPS rate to rate supported by sensor.

www.nvidia.com