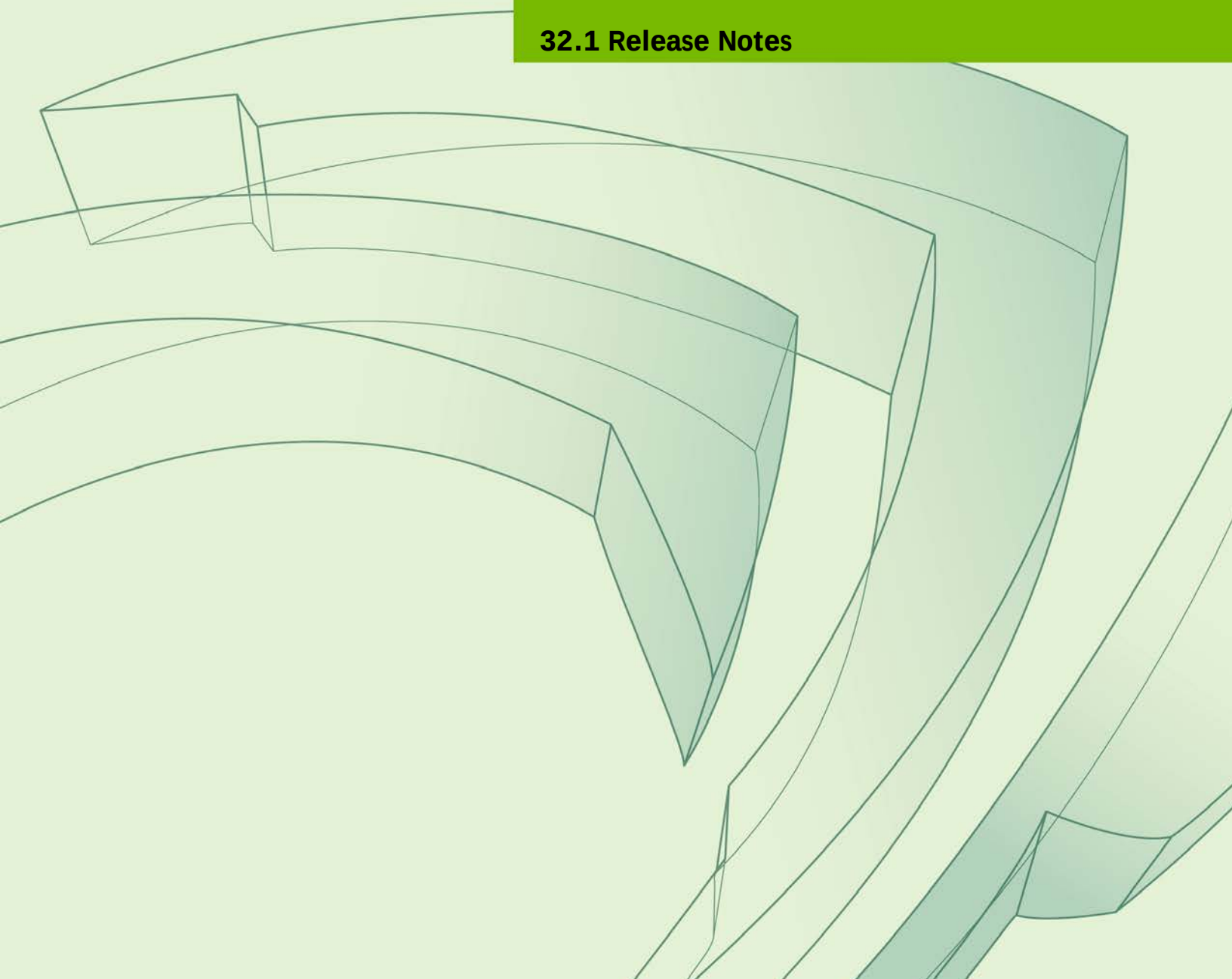
NVIDIA

TEGRA LINUX DRIVER PACKAGE

RN_05071-R32 | March 18, 2019
Subject to Change

32.1 Release Notes



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1.0 About this Release

The NVIDIA® Tegra® Linux Driver Package (**L4T**) 32.1 release supports development on the NVIDIA® Jetson Nano™, Jetson AGX Xavier™, and Jetson™ TX2/TX2i Developer Kit.

Note:	This release is intended for use with NVIDIA NVIDIA Jetson Nano, Jetson AGX Xavier, and Jetson TX2/TX2i. NVIDIA does not provide support for this release on other products that are not listed above.

Platform and Release Information

Description	Supported Version
Host machine version for flashing software onto Jetson devices.	Ubuntu x64 16.04 or 18.04 (x64 distribution)
Sample rootfs derived from Ubuntu operating system to run on Jetson devices.	Ubuntu 18.04 (arm64 distribution)
Supported Linux kernel version.	4.9
Supported ARM architecture.	aarch64
The board/module name, used in flashing and paths in the software.	Jetson AGX Xavier: jetson-xavier Jetson TX2: jetson-tx2 Jetson TX2i: jetson-tx2i Jetson Nano: p3448-000 or jetson-nano-qspi-sd
The board/module and revision number.	Jetson AGX Xavier: P2972-0000 Jetson TX2: P2771-0000 Jetson TX2i: P3489 Jetson Nano: P3450-0000
The release tag name. Consult the kernel source to identify the tag name at: http://nv-tegra.nvidia.com/gitweb/?p=linux-4.9.git	tegra-l4t-r32.1

Description	Supported Version
Kernel source are live across several repositories. Consult the topic Kernel Customization > Obtaining the Kernel Sources with Git in the *Development Guide* for details.	

1.1 Login Credentials

Starting with release 32.1, NVIDIA no longer provides a default user name and password for log-in. Follow the system prompts at first boot to create your own user credentials.

2.0 Known Issues

This section provides details about issues discovered during development and QA but not resolved in this release.

2.1 General System Usability

The following general system usability related issues are noted in this release.

Issue	Description
2515130, 258714	On Jetson Nano, depending on the SD card speed, user may observe slow loading of certain applications such as a generic file editor and image viewer.
2524344, 200498151	Jetson Nano currently does not implement power-based throttling. The system may shut down if adapter power capacity is exceeded. This will not happen if the system is used with a validated power adapter that provides adequate power.
2496962	Low-latency audio decode requires customer to set memory and CPU speeds accordingly.
2521704	On Jetson Nano, when a GPIO is released (e.g. using the `sysfs` unexport file, the `cleanup()` function in the `Jetson.GPIO` Python module, or the `gpio_free()` function in the Linux kernel), the kernel configures the pin as a special function (SFIO) rather than as a GPIO input. In some cases, this causes Jetson to drive a signal onto the pin. If another device is also connected to that pin, and is also driving a signal, this causes an electrical conflict, which may damage the hardware. This issue is particularly relevant for the pins on the 40-pin GPIO expansion header.
200431304	On Jetson AGX Xavier, user cannot ping the IP address 0.0.0.0.
200488963	Nano `/dev/root` device size is restricted to 14 GB when using `flash.sh` to write to an SD card. User cannot create additional partitions on the root device, so any excess space is unavailable.
200492517	On Jetson Nano, system error occurs at `gether_connect+0x80/0x1d8` during SC7 stress. The issue's reproducibility is very low.

Issue	Description
200497890	USB device mode network feature always reports that it is active, even when the USB cable is not plugged in. This causes Jetson's graphical interface to claim that a network connection is active at all times.
200498221	On Jetson Nano, when connecting to both HDMI and DP displays at bootup, login screen may only be visible on HDMI. Once logged in, the NVIDIA logo appears only on DP and is not centered, leaving the HDMI display blank.
200499128	On Jetson TX2, OSidle power consumption is comparatively higher than in public release 28.3.

2.2 Boot

The following boot related issues are noted in this release.

Issue	Description
2510850	For Jetson AGX Xavier, Secureboot with PKC keys works only if flashing follows immediately after signing. This is due to missing files located inside a temp directory that is cleared if the two actions are not performed back-to-back. To work around the problem, apply the patches described in “Failure in Secureboot with PKC Keys.”
200471553	On Jetson AGX Xavier, changing boot device order requires reflash. The user cannot change boot order from the command line.
200480903	On Jetson-Xavier, UFS card fails to automount on boot. User can mount UFS devices manually or through the GUI. This was tested with ext4 and vfat formats.
200492423	On all Jetson platforms, using the new OEM configuration, a minor glitch is observed during EULA screen presentation at first boot.

2.3 Camera

The following camera related issues are noted in this release.

Issue	Description
200407802	On Jetson TX2 and Jetson AGX Xavier using the six-camera module (E3333), memory leakage occurs in the nvargus daemon.
200459897	On Jetson AGX Xavier, blur and corruption in the form of a vertical black stripe of pixels at one side of the image are observed with an SLVS-EC sensor.
200461442	On Jetson AGX Xavier, the Multimedia API front end sample application exhibits a low frame rate when using the IMX185. This is a regression due to VIC frequency dependency.

Issue	Description
200476911	On Jetson AGX Xavier, users cannot use specific cameras that support the “wait until trigger” mechanism. This mechanism is intended to trigger the sensor using an external signal to capture a specified number of frames, then stop streaming until triggered again.
200490050	On Jetson Nano, hardware de-noise functionality, denosiestrength, has less impact than expected.
200490661	On TX2, the IMX390 dual sensor camera fails to capture simultaneously with both sensors when running two separate applications to capture from CSI/GMSL. Simultaneous capture from a single application is successful.

2.4 CUDA Samples

The following CUDA samples related issues are noted in this release.

Issue	Description
200500995	If the system date and time are not set correctly after boot, be sure the configured NTP server is accessible from your network.

2.5 Multimedia

The following multimedia related issues are noted in this release.

Issue	Description
2517881	L4T currently does not support hardware acceleration for VLC Player. To work around this issue, enter this command to run VLC Player with software decoding: `vlc --codec=avcodec <filename>`
200297610	If the user launches an argus camera with Piecewise Linear WDR sensor mode enabled and changes the AWB mode from Auto to another setting (Incandescent, Fluorescent, etc.), then changes AWB mode back to Auto, preview hangs. This is a corner case and is not handled in this release.
200427796	The new gst-v4l2 decoder has an issue with 10/12-bit HEVC decode. Blueish video observed due to interchanged U and V planes getting read for 8-bit transform. This type of decode works correctly with the legacy OMX-based decoder.
200489184	When using DRM for display, display modes using YUV format are not supported, and are not properly filtered out by the DRM subsystem. To avoid this issue, select RGB modes only, or use X11, which filters out YUV modes correctly.
200490095	On Jetson Nano, raw capture at 4K resolutions using an IMX219 camera exhibits corruption. Capture at 4K resolutions using Argus (“cooked” instead of raw) is functional.

Issue	Description
200502065	GST pipeline using camera capture with scaling/color conversion may affect performance. NVIDIA recommends setting the `nvarguscamerasrc` property `maxperf=1` for better performance. For more details, see the "Camera Capture" section of *Accelerated GStreamer User Guide*.
200502136	`nvgstcapture-1.0` has an image encoding issue using the `nvjpegenc` plugin for default YUY2 video capture format for a USB camera. To work around the issue, use the OSS `jpegenc` plugin instead of `nvgstcapture-1.0` for image encoding with a USB camera. To do this, add the command line switch `--image-enc=0` to the `nvgstcapture-1.0` capture command, for example: `nvgstcapture-1.0 --camsrc=0 --image-enc=0`

3.0 Top Fixed Issues

These issues are resolved in this release.

3.1 General System Usability

General system usability related resolved issues are as follows:

Issue Number	Description
200437318	Tegrastats does not save information to a file.
200454955	Kernel PWM fan driver overrides fan setting applied by jetson_clocks.sh.

3.2 Camera

Camera related resolved issues are as follows:

Issue Number	Description
200422466	IMX185 sensor not supported in this release.

4.0 Documentation Corrections

This section describes errors in documentation that were discovered too late to be corrected.

4.1 Adaptation and Bring-Up Guide

These corrections apply to the *Jetson AGX Xavier Platform Adaptation and Bring-Up Guide*.

4.1.1 PCIe Controller Configuration

In the command line example, replace this command:

```
kernel/nvidia/Documentation/devicetree/bindings/pci/nvidia,tegra19x-
pcie.txt
```

With this:

```
$(KERNEL_TOP)/Documentation/devicetree/bindings/pci/nvidia,tegra19x-
pcie.txt
```

4.2 Graphics Sample Application

In the "Graphics Sample Application" topic of *NVDIDIA Tegra Linux Driver Package*, make the changes described below.

Building the Samples

In the paragraph that begins "The sample source files are available…" change the pathname from `$HOME/graphics_demos` to `/usr/src/hvidia/graphics_demos`.

In the paragraph that begins “The sample applications may be built…” change the pathname from `$HOME/graphics_demos/README` to `/usr/src/hvidia/graphics_demos/README`.

After the paragraph that begins “L4T also provides…” change the pathname from:

```
$HOME/graphics_demos/bin
```

To:

```
/usr/src/hvidia/graphics_demos/prebuilts/bin
```

Running the Sample applications

After the paragraph that begins “For example, to run…” change the command:

```
$ cd /home/nvidia/graphics_demos/prebuilts/bin/<graphics>
```

To:

```
$ cd /usr/src/nvidia/graphics_demos/prebuilts/bin/<graphics>
```

To install and run the Gears application

Change the following command line:

```
# deb http://ports.ubuntu.com/ubuntu-ports/ xenial universe
```

To:

```
# deb http://ports.ubuntu.com/ubuntu-ports/ bionic universe
```

Wayland

Delete the paragraph that begins “Before you can run Wayland graphics sample applications…”

Insert the following text in its place:

> Before you can run the Wayland graphics sample applications, you must first stop the X server (which is running by default) and then launch Weston either by running the Weston binary (`/usr/bin/weston`) from the root user or by running the `Weston-launch` binary (`/ usr /bin/ weston -launch`).

To run the Wayland graphics sample applications

1. Enter these commands to stop the X server:

```
$ sudo systemctl stop gdm
$ sudo loginctl terminate-seat seat0
$ sudo pkill -9 X
```

2. Enter these commands to run Weston from the root user:

```
$ sudo su
$ unset DISPLAY
$ mkdir /tmp/xdg
$ chmod 700 /tmp/xdg
$ export XDG_RUNTIME_DIR=/tmp/xdg
$ weston --idle-time=0 &
```

3. Enter these commands to run Weston using `weston-launch` as a non-root user. These commands need be entered only once after booting:

```
$ sudo groupadd weston-launch
$ sudo usermod -a -G weston-launch $USER
$ sudo chown root /usr/bin/weston-launch
$ sudo chmod +s /usr/bin/weston-launch
$ weston-launch
```

5.0 Implementation Details

5.1 Video Decoder Instance Selection Planned Deprecation

NVIDIA® Tegra® Linux Driver Package (L4T) 32.1 release supports workload scaling across available decoder instances.

To ensure portability of code across product generations, the interfaces for specification of the NVIDIA Video Decoder instance are deprecated in this release.

The interfaces deprecated include:

- V4L2 external control ID `V4L2_CID_MPEG_VIDEO_DECODE_INSTANCE`
- GStreamer decoder property `dec-instanceId`

5.2 Symlinks May be Overwritten by Installation of Third Party Libraries

Installing third party libraries on the target device may overwrite the accelerated library provided by Linux for Tegra.

For example, installing 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`.

Linux for Tegra installs a boot-time initialization script `/etc/init/nv.conf`, that corrects typical occurrences, such as with OpenGL, EGL, and X11 GLX libraries. This script runs at boot and corrects typical occurrences.

To workaround

- Reboot after installation of packages that install conflicting library symlinks.

5.3 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 and function correctly.

5.4 Type-C Devices Unable to Drive DisplayPort

This is Known Issue 2183567.

For DP, Bootloader display polls for at most 1 msec. by default when trying to detect whether HPD has been asserted by the sink. Different Type-C downstream devices connected to the Type-C ports on Jetson AGX Xavier (cables, adapters, hubs, etc) may incur different amounts of latency before they trigger the handshake process needed to drive DP over Type-C.

Workaround: If a seamless display does not come up with the Type-C device you are using, try increasing the HPD_TIMEOUT_MS value in `tegrabl_display_dtb.c`. We recommend increasing the timeout value in 500 msec. increments. Increasing the timeout value guarantees interoperability with a larger variety of devices, but also increases the boot time.

5.5 Instability after GDM Restart

After GDM restart, multiple issues may appear like desktop not coming back (device entering infinite loop of tegradc blank/unblank) or unable to log in.

Workaround: Add this line to `/lib/systemd/system/gdm.service`:

```
ExecStopPost=/bin/loginctl terminate-seat seat0
```

5.6 DLA Cores Do Not Support INT8

The DLA can accelerate Deep Learning inference workloads with INT8 and FP16. In this developer preview release, only FP16 is supported. INT8 will be supported in a later release.

5.7 OpenGL-ES 1.1 Support Not Available

OpenGLES 1.1 support is not present in this release because Canonical did not provide the `libGLESv1_CM.so` library as part of GLVND libraries in Ubuntu 18.04. Any app that is linked with this library cannot run.

Canonical is working on the issue via bug https://bugs.launchpad.net/ubuntu/+source/libglvnd/+bug/1780039.

After the bug is fixed, an updated GLVND package will be available for Ubuntu 18.04 (Bionic). After the update is applied, `libGLESv1_CM.so` will be available and OpenGLES 1.1 support will work as expected without requiring any changes to the BSP.

5.8 Khronos Conformance Status

This release supports the following Khronos APIs:

- OpenGL-ES 3.2
- OpenGL 4.6
- Vulkan 1.1

The product is based on a published Khronos specification. It has been submitted to, and is expected to pass, the Khronos Conformance Process. Current conformance status can be found at http://www.khronos.org/conformance.

The CTS test version used to run conformance for each of the APIs is:

- OpenGL-ES: 3.2.5.0
- OpenGL: 4.6.0.0
- Vulkan: 1.1.1.2

5.9 Visual Profiler Launch Failure Workaround

This is Known Issue 200436049.

To run Visual Profiler on Ubuntu 18.04:

Install the package `openjdk-8-jre`, and

Invoke Visual Profiler with the `-vm` command line option included:

```
nvvp -vm /usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java
```

The `-vm` option is only required if JRE is not included in CUDA Toolkit package and JRE 1.8 is not in the default path.

5.10 EMC Frequency Adjustment for CPU Workload

This note addresses the potential performance drop identified in Known Issue 2419317.

On Jetson AGX Xavier, the EMC frequency for CPU workload is decided by the static CPU-EMC mapping table and the mc_all activity monitor (actmon) driver. The CPU-EMC mapping table decides base minimum EMC frequency based on CPU frequency. The mc_all actmon is responsible for scaling EMC frequency from the base minimum to a higher value proportional to memory bandwidth utilization.

In this release the CPU-EMC mapping table is tuned, that is, the EMC base frequency mapped to CPU frequency has been reduced to optimize power consumption. The tuned CPU-EMC table does not affect performance of the GPU, NVDEC, and NVENC workloads, as each has its own EMC scaling algorithm, but it may affect CPU workload performance, especially when CPU load is high and bandwidth utilization is low. If any such performance drop is observed, the CPU-EMC mapping table can be tuned in this location, based on performance/power requirements:

```
<source>/hardware/nvidia/soc/t19x/kernel-dts/tegra194-soc/tegra194-soc-base.dtsi
```

5.11 GPU Debug and Profiling Tools Must Be Run as Root

By default GPU debug and profiling tools now require running as root, or launching with the sudo command, to function correctly.

The system administrator can grant privileges to general users if preferred.

5.12 Beta Level Support for HBR3

This release provides beta level support for HBR3 with DisplayPort version 1.4a.

5.13 GStreamer Plugin gst-omx deprecated

The GStreamer plugin `gst-omx` is deprecated in this release. NVIDIA recommends using the `gst-v4l2` plugin instead. For more information, see the *Accelerated GStreamer User Guide*.

5.14 Failure in Secureboot with PKC Keys

For Jetson AGX Xavier, Secureboot with PKC keys works only if flashing immediately follows signing. This is because flashing loses files located in a temporary directory that is cleared if the two actions are not performed back-to-back.

Secureboot with PKC *and* SBK works as expected.

To work around the problem, apply the following patches:

1. Patch 1:

```
--- a/bootloader/tegraflash_internal.py
+++ b/bootloader/tegraflash_internal.py
@@ -3184,7 +3184,8 @@ def tegraflash_generate_mem_bct(is_cold_boot_mb1_bct):
             tegrabct_values['--membct_rcm'] = tegraflash_oem_encrypt_and_sign_file('mem_rcm.bct' ,True, 'MEMB')
             tegrabct_values['--membct_rcm'] = tegraflash_oem_encrypt_and_sign_file(tegrabct_values['--membct_rcm'] ,False, 'MEMB')
         else:
-            tegrabct_values['--membct_rcm'] = tegraflas_oem_sign_file(mem_bcts[ramcode], 'MEMB')
+            shutil.copyfile(mem_bcts[ramcode], 'mem_rcm.bct')
+            tegrabct_values['--membct_rcm'] = tegraflas_oem_sign_file('mem_rcm.bct', 'MEMB')

 def tegraflash_generate_mb1_bct(is_cold_boot_mb1_bct):
     if bool(is_cold_boot_mb1_bct) == True:
```

2. Patch 2:

```
--- a/bootloader/odmsign.func
+++ b/bootloader/odmsign.func
@@ -714,6 +714,7 @@ odmsign_sbk_and_pkc_flashing ()
                         BCTARGS+="--mb1_cold_boot_bct mb1_cold_boot_bct_MB1.bct_sigheader.encrypt.signed ";
                 else
                         BCTARGS="--mb1_bct mb1_bct_MB1_sigheader.bct.signed ";
+                        BCTARGS+="--mem_bct mem_rcm_sigheader.bct.signed ";
                         BCTARGS+="--mb1_cold_boot_bct mb1_cold_boot_bct_MB1_sigheader.bct.signed ";
                 fi;
                 BCTARGS+="--mem_bct_cold_boot mem_coldboot_sigheader.bct.signed ";
```

5.15 gst-omx plugin is deprecated

The `gst-omx` plugin is deprecated in Linux for Tegra (L4T) release 32.1, and will be removed in a future release (issue 200420440).

NVIDIA recommends using the `gst-v4l2` plugin for development instead. See the *Accelerated GStreamer User Guide* for usage information.

6.0 About Earlier Releases

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Known Issues

General System Usability

The following general system usability related issues are noted in this release.

Issue	Description
2419317	Performance drop due to EMC frequency not set correctly for CPU workload. (See EMC the Implementation Note Frequency Adjustment for CPU Workload.)
200461808	When connecting the Intel IGB PCIE card, CPU errors may occur during system idle.
200436049	Failure to launch NVVP after installing `cuda-repo-ubuntu1804-10-0-local-10.0.96-410.27_1.0-1_amd64.deb`.
200464272	System may fail to enter SC7 state when certain PCIe Network Interface Cards are connected. (Issue was seen with two different NICs, neither of which uses the igb driver). This issue is under investigation.

Camera

The following camera related issues are noted in this release.

Issue	Description
2032213	The maximum value that `getExposureTimeRange()` may return is 400000000.000 (400,000,000 nanoseconds, 400 msec).
200297610	Preview freeze with WDR mode when AWB lock is set and user attempts to change AWB mode to Auto.

200455493	Defog feature of `argus_camera` app is not supported in this release. The following options of `argus_camera` app do not work:
	`--defog=ENABLE`
	`--defogamount=AMOUNT`
	`--defogquality=QUALITY`

200455200	`argus_userautoexposure` app failed to run the sample in DOL WDR modes.
200455287	`argus_userautowhitebalance` app gives greenish preview on high exposure scenes.
200459897	Blur and corruption observed with SLVS-EC sensor.
200443798	VisionWorks `nvx_sample_nvgstcamera_capture` sample application fails to run.

CUDA Samples

The following CUDA samples related issues are noted in this release.

Issue	Description
200448615	Argus CUDA samples crash or hang for CPHY sensor IMX318, possibly due to very high resolution of the sensor. If the resolution is set to less than 4K in EGL stream settings, the sample passes successfully.

Multimedia

The following multimedia related issues are noted in this release.

Issue	Description
200387512	gstreamer based video playback using Wayland not working when Weston is started as an NVIDIA user.

Top Fixed Issues

These issues are resolved in this release.

General System Usability

General system usability related resolved issues are as follows:

Issue Number	Description
200437318	Tegrastats does not save information to a file.
200454955	Kernel PWM fan driver overrides fan setting applied by jetson_clocks.sh.

Camera

Camera related resolved issues are as follows:

Issue Number	Description
200422466	IMX185 sensor not supported in this release.

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Known Issues

General System Usability

The following general system usability related issues are noted in this release.

Issue	Description
2183567	Type-C devices unable to drive DP due to length of delay before handshake begins. *Workaround*: see Type-C Devices Unable to Drive DisplayPort.
200441525	An application to be debugged NVIDIA Developer Tools (CUDA tools, NVIDIA Nsight Systems/Graphics) must be run as the root user, or with root permissions.
2218290	Thermal shutdown reboots system instead of powering off.
200436049	nvvp (Visual Profiler) launch fails after installing `cuda-repo-ubuntu1804-10-0-local-10.0.96-410.27_1.0-1_amd64.deb`.
200442461	VisionWorks SFM sample fails to run; shows black image when launching `nvx_sample_sfm  sample`.
200447045	SC7 system suspend/resume may have intermittent resume failures in this release.

Boot

The following boot related issues are noted in this release.

Issue	Description
2305640	CBoot bootloader cannot access USB mass storage devices connected via a USB hub.

Camera

The following camera related issues are noted in this release.

Issue	Description
2258817	Incorrect ISP settings may be applied if camera module is replaced with a module that does not support a unique identifier (fuse ID). (Workaround: manually remove the cached `.bin` files in `/var/nvidia/nvcam/settings`.)
200422466	IMX185 sensor not supported in this release.
200445964	Greenish image capture with `argus_onshot`.
2199266	Temporal noise reduction may cause a slight green tint to images.
200407738	Greenish tint on displayed preview image when running the sample software `argus_userautowhitebalance`.

CUDA

The following CUDA related issues are noted in this release.

Issue	Description
200431121	If a CUDA application calls `malloc()` within a CUDA kernel (device-side `malloc`) while running concurrently with another CUDA or GPU-accelerated graphics application, the application may fail.

Display

The following display related issues are noted in this release.

Issue	Description
2284878	Cannot operate GeChic 1101 display connected through USB-C to USB-A when aut-search mode is enabled.
200404683	Display Port (DP) monitors do not show a bootloader splash screen at boot, and may require a hotplug after boot to display content properly.
200434425	Display driver may produce “Failed to write DPCD data” errors after a display hotplug with certain monitors including Dell U2413 and Dell U2713.

JetPack Installer

The following JetPack Installer related issues are noted in this release.

Issue	Description
2340186	After installation of CUDA 10.0 host packages, the apt package management system may produce "Failed to fetch" messages due to the addition of the arm64 architecture to the apt package repository configuration.

Kernel

The following kernel related issues are noted in this release.

Issue	Description
200443630	Hotplugging a UFS card may cause the Linux kernel to report a CPU SError.
200399574	Using USB devices that are not fully compatible with the USB Gen2 specification may cause kernel error messages like “tegra-xusb 3610000.xhci: Cannot set link state.”
2211831	UART serial console using USB to TTL serial cable does not work.

Notice

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