NVIDIA TEGRA LINUX DRIVER PACKAGE
R21.4 RELEASE

DA_06297-R21 | July 10, 2015
Advance Information | Subject to Change

Detailed SW Feature List

DOCUMENT CHANGE HISTORY

DA_06297-R21

Version	Date	Authors	Description of Change
v1.0	10 May 2012	whsu / kstone	Initial release
v2.0	09 Sep 2012	whsu / mzensius / alevinson	Updated for R16 release
v3.0	21 May 2013	whsu / mzensius	Updated for R16.3 release
v4.0	17 Sep 2014	whsu / mzensius	Updated for R19.3 release
v5.0	26 May 2015	mzensius	Updated for R21.3 release
v6.0	10-Jul-2015	emilyh	Updated for R21.4 release

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NVIDIA TEGRA LINUX DRIVER PACKAGE DETAILED FEATURE LIST

This document provides a detailed list of features implemented in the NVIDIA® Tegra® Linux Driver Package.

Tegra Linux Driver Package (L4T) supports the Jetson TK1 reference platform.

Here are some guidelines for reading the information in this document:

- Platform support—unless otherwise specified in the Notes column, the feature is supported on all supported platforms.
- Features with a note containing "Early-access feature" are provided for evaluation with limited testing and are subject to change.

Feature Overview

This document contains tables for the following feature categories:

PROCESSOR

SKU Supported	Description	Notes
CD575M	Duty Cycle Support: 24 x 7 (Use Case 1) 4/4/16 (Use Case 2)	Refer to Datasheet
CD575MI	Duty Cycle Support: 24 x 7 (Use Case 1) 4/4/16 (Use Case 2)	Refer to Datasheet

Note: Refer to product documentation for software support to enable use cases.

TOOL CHAIN

Feature	Description	Notes
ARM Cortex-A9 processor	arm-cortex_a9-linux-gnueabi	-
GNU Compiler Collection	gcc-4.5.3-glibc-2.11.3	-

LINUX GSTREAMER (0.10/1.0) FRAMEWORK

Refer to the Tegra Linux Driver Package Multimedia User Guide for detailed information on capabilities and use of hardware-accelerated plugins for Gstreamer.

Note: Numbers in parentheses in the following table indicate the relevant version of Gstreamer.

Feature	Description	Notes
H.264/AVC Video Decoder	nv_omx_h264dec (0.10) omxh264dec (1.0)	skip-frames (0.10, 1.0) disable-dpb (1.0)
MPEG-4 Video Decoder	nv_omx_mpeg4dec (0.10) omxmpeg4videodec (1.0)	skip-frames (0.10, 1.0) disable-dpb (1.0)
VP8 Video Decoder	nv_omx_vp8dec (0.10) omxvp8dec (1.0)	skip-frames (0.10, 1.0) disable-dpb (1.0)
H.263 Video Decoder	nv_omx_h263dec (0.10) omxh263dec (1.0)	skip-frames (0.10, 1.0) disable-dpb (1.0)

Feature	Description	Notes
JPEG Image Decoder	nvjpegdec (0.10) nvjpegdec (1.0)	idct-method (0.10, 1.0)
H.264/AVC Video Encoder	nv_omx_h264enc (0.10) omxh264enc (1.0)	Bitrate (0.10) Quality-level (0.10) Rc-mode (0.10) Qp-range (0.10) Temporal-tradeoff (0.10) Bit-packetization (0.10) Low-latency (0.10) Framerate (0.10) Control-rate (1.0) Target-bitrate (1.0) Quant-i-frames (1.0) Quant-p-frames (1.0) Quant-b-frames (1.0)
VP8 Video Encoder	nv_omx_vp8enc (0.10) omxvp8enc (1.0)	Bitrate (0.10) Quality-level (0.10) Rc-mode (0.10) Qp-range (0.10) Temporal-tradeoff (0.10) Bit-packetization (0.10) Low-latency (0.10) Framerate (0.10) Control-rate (1.0) Target-bitrate (1.0) Quant-i-frames (1.0) Quant-p-frames (1.0) Quant-b-frames (1.0)
JPEG Image Encoder	nvjpegeng (0.10) nvjpegenc (1.0)	Quality (0.10, 1.0) Idct-method (0.10, 1.0)
Video Sink, X11 Window	nveglglessink (1.0)	max-lateness (1.0) qos (1.0) async (1.0) ts-offset (1.0) last-sample (1.0) enable-last-sample (1.0) blocksize (1.0) render-delay (1.0) throttle-time (1.0) max-bitrate (1.0) show-preroll-frame (1.0) create-window (1.0) force-aspect-ratio (0.10, 1.0)

Feature	Description	Notes
Video Sink, Panel Overlay	nv_omx_videosink (0.10) nvoverlaysink (1.0)	x-scale (0.10) y-scale (0.10) overlay (0.10) overlay-depth (0.10) overlay-x (0.10) overlay-y (0.10) overlay-w[width] (0.10) overlay-h[height] (0.10 rotation (0.10) display [name] (0.10) force-aspect-ratio (0.10) contrast (0.10) brightness (0.10) hue (0.10) saturation (0.10) max-lateness (0.10, 1.0) qos (0.10, 1.0) async (0.10, 1.0) ts-offset (0.10, 1.0) last-buffer (0.10) enable-last-buffer (0.10) last-sample (1.0) enable-last-sample (1.0) blocksize (0.10, 1.0) render-delay (0.10,1.0) throttle-time (0.10, 1.0) max-bitrate (1.0) show-preroll-frame (1.0)
Video Sink, HDMI Overlay	nv_omx_hdmi_videosink (0.10) nvhdmioverlaysink (1.0)	x-scale (0.10) y-scale (0.10) overlay (0.10) overlay-depth (0.10) overlay-x (0.10) overlay-y (0.10) overlay-w[width] (0.10) overlay-h[height] (0.10 rotation (0.10) display [name] (0.10) force-aspect-ratio (0.10) contrast (0.10) brightness (0.10) hue (0.10) saturation (0.10) max-lateness (0.10, 1.0)

Feature	Description	Notes
		qos (0.10, 1.0) async (0.10, 1.0) ts-offset (0.10, 1.0) last-buffer (0.10) enable-last-buffer (0.10) last-sample (1.0) enable-last-sample (1.0) blocksize (0.10, 1.0) render-delay (0.10,1.0) throttle-time (0.10, 1.0) max-bitrate (1.0) show-preroll-frame (1.0)
Format Conversion	nvvidconv (0.10) nvvidconv (1.0)	raw-yuv <-> nv-yuv (0.10) raw-yuv <-> nvrm-yuv (0.10) raw-gray <-> nv_yuv (0.10) raw-gray <-> nvrm-yuv (0.10) nv-yuv <-> raw-rgb (0.10) nvrm-yuv <-> raw-rgb (0.10) nv-yuv <-> raw-yuv (0.10) nvrm-yuv <-> raw-yuv (0.10) nv-yuv <-> raw-gray (0.10) nvrm-yuv <-> raw-gray (0.10) raw(yuv)<-> raw(yuv-memory:NVMM) (1.0) raw(gray)<-> raw(yuv-memory:NVMM) (1.0) raw(yuv-memory:NVMM) <-> raw(yuv) (1.0) raw(yuv-memory:NVMM) <-> raw(gray) (1.0)
Video Scaling	nvvidconv (0.10) nvvidconv (1.0)	Input/Output formats supported: raw-yuv (0.10, 1.0) raw-gray (0.10, 1.0) nv-yuv (0.10) nvrm-yuv (0.10) raw-rgb (0.10, output only)
Capture application, Gstreamer-based	nvgstcapture-0.10 nvgstcapture-1.0	USB camera (0.10, 1.0) CSI camera (1.0) Preview Still image capture Video capture
Video playback application, Gstreamer-based	nvgstplayer-0.10 nvgstplayer-1.0	-
Gstreamer CUDA Plugin	Gst-videocuda	(1.0)Gstreamer CUDA plugin implementation for video post and preprocessing.

LINUX AUDIO

Feature	Description	Notes
System sounds	ALSA Driver	-
HDMI Audio	-	-
Multi-instance audio decode	Pulse Audio	-

KERNEL

Feature	Description	Notes
Linux Kernel	K3.10	-
SMP	-	-
CPU hot plug support	-	-
System MMU	-	-
System RAM	-	LPAE (equal to or greater than 4 GB) not supported

POWER MANAGEMENT

Feature	Description	Notes
CPU DVFS	-	-
EMC DVFS	-	-
Low-power idle state	Deep Sleep (LP0) and Suspend (LP1	-
CPU auto hotplug	-	-
4+1 CPU	-	-
Thermal Management	**Description**	**Notes**
External temperature sensor (NCT1008)	-	-
Dynamic thermal throttling	Software with hardware fail-safe	-
LP1 support	**Description**	**Notes**
Wake with power button and RTC	-	-
Ultra-Low-Power Standby (LP0)	**Description**	**Notes**
DRAM self-refresh	Not enabled by default	-
Deep Sleep support	-	-
USB Suspend during Deep Sleep	-	-

Miscellaneous features	Description	Notes
Power off button support	-	-

I/O INTERFACES

Feature	Description	Notes
DDR3L (Hynix 2 GB)	-	-
USB0 Host	USB 2.0 Micro-AB	-
USB0 (2.0) Device	USB 2.0 Micro-AB	-
USB1 (2.0) Host	Half-miniPCIe Socket	-
USB2 (2.0) Host	USB 3.0 Type A	-
USB3 (3.0) Host	USB 3.0 Type A	-
PCIe x1 (lane 2)	RTL8111GS Ethernet	-
PCIe x1 (lane 4)	Half-miniPCIe Socket	-
SATA	SATA Connector	-
HDMI	HDMI Connector	-
HDMI Hotplug detect	HDMI Connector	-
CSI A/B (x4)	General Expansion Header	V4L2 API (ISP Bypass)
SDMMC3	SDcard Socket	-
SDMMC4	eMMC	-
I2S1 (DAP2)	Audio Codec (ALC5639)	-
GEN1_I2C (I2C1)	Various	-
CAM_I2C (I2C3)	General Expansion Header	-
DDC (I2C4)	HDMI Connector	-
PWR_I2C (I2C5)	PMU	-
UARTD	Debug UART	-
JTAG	-	-

BOARD SUPPORT PACKAGE (BSP)

Feature	Description	Notes
Real-time clock	-	-
8250 UART for debug console	tty50	-
High-speed UART for peripherals	ttyTHS0, ttyTHS0 ttyTHS2	-
I2C master	-	-
USB gadget	Additional configuration required	-

USB host	-	-
USB Ethernet	-	-
USB 2.0 host	Default to MSC	-
USB 3.0 host	-	-
USB mouse	-	-
USB thumb drive	-	-
Framebuffer Console	HDMI, eDP is tested with expansion board	-
SDHCI driver for eMMC 4.5	-	-
External SD card support	-	-
USB mass storage device	Host mode only	-
Multi-touch screen	No touch support	-
Headphone jack	-	-
APB DMA	-	-
SATA	mSATA is supported	-
PMU	**Description**	**Notes**
PWM backlight	No backlight support	-
Battery charging (ADC)	No battery charging	-
PMIC AMS (A53722)	-	-
PMIC reset	-	-
Sensors	**Description**	**Notes**
Gas gauge	No gas gauge	-
Thermal monitor	-	-
PCI-Express	**Description**	**Notes**
PCI device enumeration	MiniPCi x1 with Real Tek Ethernet is supported	-

BOOT LOADERS

Boot Loader	Feature	Notes
Fastboot	Boot Device	eMMC
	Root Device	USB, SD, eMMC, SATA
	Display device	UART
U-Boot	Boot Device	eMMC, Ethernet
	Root Device	USB, SD, eMMC, NFS
	Display device	UART
Update Utility	Utility to configure boot loader parameters in BCT	-

MULTIMEDIA

Audio	Notes
Multi-instance audio decode	-
Multichannel playback	-
USB audio record	-
Video	**Notes**
Multi-Stream Video Encode	-
Video-only mode	-
4K playback	-
Media APIs	**Notes**
Gstreamer-0.10	-
Gstreamer-1.0	-

DISPLAY

Feature	Resolution	Notes
Supported resolutions	640 X 480	-
Framebuffer console device	HDMI	-
Dual-display support	HDMI + eDP	-
Primary display type/default resolution	HDMI	Default resolution 1920 x 1080
Secondary display type/resolution	eDP	-
Supported resolutions	640 X 480	-
	720 X 576	-
	1024 X 768	-
	1280 X 720	-
	1280 X 1024	-
	1920 X 1080	-
	3840 X 2160	-
	4096 X 2160	-

GRAPHICS AND DISPLAY API SUPPORT

API	Version	Notes
GLX	1.4	Compatible with OpenGL
EGL	1.4	Compatible with OpenGL ES
OpenGL	4.4	-
OpenGL ES	3.1	-
X11 ABI	15, 18, and 19	-
Xrandr	1.4	-

DECODERS

Audio Decoders

Audio Decode	Profile	Sampling Frequency	Bit rate	Notes
AAC+	Mono and stereo for SBR; plus limited support (described in Notes) for multichannel AAC+ (AAC+SBR)	8-48 kilohertz (kHz)	8-320 kilobits per second (kbps)	For multi-channel AAC+ (AAC+SBR) streams, only the AAC multi-channel is decoded. The 5.1 channels are down-mixed to stereo.
AAC-LC	Mono and stereo; plus 5.1 channels down-mixed to stereo	8-48 kHz	8-320 kbps	-
AAC-LC multichannel	6 channel [5.1]	8-48 kHz	8-320 kbps	Output over HDMI
eAAC+	Stereo only	8-48 kHz	8-320 kbps	-
AMR-NB	1 channel	Up to 8 kHz	4.75-12.2 kbps	-
AMR-WB	1 channel	Up to 16 kHz	6.6-23.85 kbps	-
MP3	2 channel	8-48 kHz	32-320 kbps	-
MPEG-2 (MPEG-1 Layer 2)	2 channel	16-48 KHz	8-320 kbps	-
Vorbis	Ogg Audio	8-48 KHz	32-256 kbps	
WAV linear PCM	16-bit, 2 channels	8-48 kHz	-	-

Audio Decode	Profile	Sampling Frequency	Bit rate	Notes
WAV multichannel support	Multichannel support	-	-	-
WMA 9 *	Standard 2-channel	8-48 kHz	8-384 kbps	-
WMA Lossless *	Lossless: Up to N1 Profile; WMA 10: 2 channel	8-48 kHz	8-384 kbps	-
WMA Pro LBR 10 *	M2 Profile; 2 channel	16-96 kHz	8-768 kbps	-
WMA Pro LBR 10 multichannel *	6 channel [5.1]	16-96 kHz	8-768 kbps	-
AC3/DTS (passthrough)	Multichannel support	8-48 kHz	8-320	-

Notes

* Use of this decoder requires a BSP add-on component available only to customers with Windows Media Component licensing. For more information see http://wmlicense.smdisp.net/wmcomponents/.

Image Decoders

Image Decode	Notes
Libjpeg-8b acceleration with Tegra JPEG Decode HW	-

Video Decoders

Video Decode	Profile and Level	Sampling Frequency and Bit Rate/Frame	Notes
AVCHD	MPEG-4 AVC/H.264/VC1 1080/60i Highdef	Up to 1080p 60 fps Up to 10 Mbps	No support for AVH-DC stereoscope (3D)
DivX 4/5/6 compatible	1080p Highdef	Up to 1080p 30 fps Up to 10 Mbps	No QPEL; No interlace; No GMC
DivX 4/5/6 compatible	PlusHD	Up to 1080p 30 fps Up to 20 Mbps	-
H.263	Baseline (Profile 0)	Standard H.263 picture formats up to 4CIF 30 fps Up to 8 Mbps	Standard H.263 picture formats = SQCIF, QCIF, CIF, 4CIF

Video Decode	Profile and Level	Sampling Frequency and Bit Rate/Frame	Notes
H.264 AVC	Baseline Profile High Profile @ L4.2	Up to 1080p @ 96 fps Up to 62.5 Mbps	-
H.264 AVC	Baseline Profile High Profile @ L4.2	Up to 1440p @ 48 fps Up to 62.5 Mbps	-
MJPEG	YUV 420/ YUV 422	Up to 1080p 30 fps	-
MPEG-2 Video	Main Profile @ High Level	Up to 1080p 30 fps /1080i 60 fps Up to 80 Mbps	-
MPEG-2 Video	Main Profile @ High Level	Up to 720p 60 fps Up to 80 Mbps	-
MPEG-4	Advanced Simple Profile @ L5	Up to 1080p 30 fps Up to 10 Mbps	No QPEL; No interlace; No GMC
MVC	Multiview High Profile, Stereo High Profile	Up to 1080p 24 fps Up to 32 Mbps	Local playback and playback over HDMI
VC-1/WMV *	Simple Profile @ ML	Up to 1080p @ 48 fps Up to 1080i @ 96 fps Up to 45 Mbps	-
VC-1/WMV *	Main Profile @ HL	Up to 1080p @ 48 fps Up to 1080i @ 96 fps Up to 45 Mbps	-
VC-1/WMV *	Advanced Profile @ Level 3	Up to 1080p @ 48 fps Up to 1080i @ 96 fps Up to 45 Mbps	-
Xvid	Xvid Highdef	Up to 1080p 30 fps Up to 10 Mbps	No QPEL; No interlace; No GMC
HEVC	MP @ Level 4.0	Up to 1080p 30 fps Up to 8 Mbps	-
VP8	Version 0, 1, 2	Up to 1080p @60 fps Up to 60 Mbps Up to 2160p @ 24 fps Up to 62.5 Mbps	-

Notes

* Use of this decoder requires a BSP add-on component available only to customers with Windows Media Component licensing. For more information see http://wmlicense.smdisp.net/wmcomponents/.

ENCODERS

Audio Encoders

Audio Encode	Profile	Sampling Frequency	Bit rate	Notes
AAC-LC	-	8-48 kHz	Up to 320 kbps	-

Image Encoders

Image Encode	Profile	Resolution	Bit rate	Notes
Libjpeg-8b acceleration with Tegra JPEG EncodeHW	Exif	Up to 14 MP	Q-100	-

Video Encoders

Video Encode	Profile and Level	Sampling Frequency and Bit rate/Frame rate	Notes
H.264	Baseline Profile Main Profile High Profile @ L4.2	Up to 1080p 60 fps Up to 50 Mbps VBR/CBR	-
VP8	Version 0	Up to 1080p 60 fps Up to 60 Mbps	
H.263	Baseline Profile	-	-
MPEG-4	Simple Profile	-	-

CONTAINER FORMATS

Reader Container Formats (Gstreamer)

Codecs are provided by GStreamer. You can download GStreamer codecs from the gstreamer opensource project at:

```
http://gstreamer.freedesktop.org
```

Or you can use `apt-get` in the provided Ubuntu-derived sample file system.

The following table presents container information. See container specifications for audio/video pairing within the container.

ASF (WMV) (Gstreamer)	**Description**	**Notes**
Video	VC-1	-
Audio	WMA 10, WMA Pro, WMA Lossless	-
AVI (Gstreamer)	**Description**	**Notes**
Video	MPEG-4, H.264, DivX/Xvid	-
Audio	AAC, AAC+, eAAC+, MP3, MPEG-2, AC3	-
MPEG-4 (MP4)/3G2/3GP/MOV (Gstreamer)	**Description**	**Notes**
Video	MPEG-4, H.264, H.263	-
Audio	AAC, AAC+, eAAC+, AMR-NB, AMR-WB	-
Matroska (MKV) (Gstreamer)	**Description**	**Notes**
Video	MPEG-4, DivX/Xvid, H.264	-
Audio	AAC, AAC+, eAAC+, MP3, AC3	-
WebM (Gstreamer)	**Description**	**Notes**
Video	VP8	-
Audio	Vorbis	-
OGG (Gstreamer)	**Description**	**Notes**
Audio	Vorbis	-
MP3 (Gstreamer)	**Description**	**Notes**
Audio	MP3	-
M2TS/MPEG-TS (Gstreamer)	**Description**	**Notes**
Video	H.264, VC-1, MPEG-2	-
Audio	AAC, AAC+, eAAC+	-

Writer Container Formats (Gstreamer)

The following table presents container information. See container specifications for audio/video pairing within the container.

MPEG-4 (MP4)/3GP (Gstreamer)	Description	Notes
Video	MPEG-4, H.264, H.263, VP8	-
Audio	Audio: AAC AMR-NB, AMR-WB	-
Streaming (Gstreamer)	**Description**	**Notes**
HTTP1.0	MP3, MP4, 3GP,WMA, WMV, AVI, ASF	-
HTTP 1.1	MP3, MP4, 3GP,WMA, WMV, AVI, ASF	-
RTSP (Gstreamer)	**Description**	**Notes**
RFC 2326	Real Time Streaming Protocol (RTSP)	-
RFC 2429	H.263	-
RFC 3016	AAC-LC, AAC+, eAAC+, MPEG-4	-
RFC 3267	AMR-NB	-
RFC 3550	RTP: A Transport Protocolfor Real-Time Applications	-
RFC 3640	AAC-LC, AAC+,eAC+, MPEG-4	-
RFC 3984	MPEG-4 AVC/H.264	-

STREAMING PROTOCOLS

Streaming protocols are provided by GStreamer. You can download GStreamer codecs from the gstreamer opensource project at:

```
http://gstreamer.freedesktop.org
```

Or you can use `apt-get` in the provided Ubuntu-derived sample file system.

Hardware codecs are not included in the base release but can be provided separately under a software license agreement.

HTTP Protocols*	Formats
HTTP 1.0	3GP

	AAC
	ASF
	AVI
	MKV
	MOV
	MP3
	MP4
	TS
	WMA
	WMV
HTTP 1.1	3GP
	AAC
	ASF
	AVI
	MKV
	MOV
	MP3
	MP4
	TS
	WMA
	WMV
HTTP Chunked Mode Support	**Notes**
Chunked Mode Support	Chunked Mode Data Transfer with HTTP 1.1 only
HTTP Streaming	**Notes**
Live Streaming	-
RTSP Protocols*	**Notes**
RFC 2326	Real Time Streaming Protocol (RTSP)
RFC 2429	H.263
RFC 3016	AAC-LC, AAC+, eAAC+, MPEG-4
RFC 3267	AMR-NB
RFC 3550	RTP: A Transport Protocol for Real-Time Applications
RFC 3640	AAC-LC, AAC+, eAAC+, MPEG-4
RFC 3984	MPEG-4 AVC/H.264
Buffer control with watermarking for RTSP streaming	-

SDP Session Set Up*	Notes
RFC 4566	Session Description Protocol

Notes
* For better user experience, NVIDIA recommends limiting HTTP, RTSP, and RTP streaming tests to 1080p 30 fps 10 Mbps content over a sustained network with a bandwidth of greater than 16 Mbps.

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