



# NVIDIA VIDEO CODEC SDK APPLICATION NOTE - DECODER

NVDEC\_DA-06209-001\_v08 | June 2016

## Application Note

## DOCUMENT CHANGE HISTORY

NVDEC\_DA-06209-001\_v08

Version	Date	Authors	Description of Change	Highlight
01	June 10, 2016	SM	Updated for Video Codec SDK 7.0	Support for VP8&VP9 Decoding

# TABLE OF CONTENTS

**NVIDIA Hardware Video DECODER ..... 4**

- 1. Introduction..... 4
- 2. NVDEC Capabilities ..... 4
- 3. NVDEC Performance..... 6
- 4. Programming NVDEC..... 7

# LIST OF TABLES

Table 1. NVDEC Hardware Capabilities..... 5

Table 2. New additions in the current SDK ..... 5

Table 3. NVDEC hardware indicative decoding performance ..... 6

# NVIDIA HARDWARE VIDEO DECODER

## 1. INTRODUCTION

NVIDIA GPUs contain a hardware-based decoder (referred to as NVDEC in this document) which provides fully-accelerated hardware-based video decoding for several popular codecs. With complete decoding offloaded to NVDEC the graphics engine and the CPU are free for other operations.

NVDEC supports much faster than real-time decoding which makes it suitable to be used for transcoding applications, in addition to video playback applications.

The hardware capabilities available in NVDEC are exposed through APIs herein referred to as NVDECODE APIs (referred to as NVCUVID APIs in earlier SDKs) in the document. This document provides information about the capabilities of the NVDEC engine and the features exposed through NVDECODE APIs.

The current document *only* highlights the changes in the current Video Codec SDK package with respect to the previous SDK packages. In order to know about the features exposed in earlier SDKs please refer to the earlier SDK package(s). Any driver supporting SDK 7.0 is completely backward compatible with earlier SDKs, which means that applications compiled with earlier header(s) can be expected to work with the driver supporting SDK 7.0 and beyond.

## 2. NVDEC CAPABILITIES

At a high level, capabilities of the NVDEC engine exposed through NVDECODE APIs are summarized in Table 1 and the features exposed in the Software stack through NVDECODE APIs in the current SDK are summarized in Table 2.

Table 1. NVDEC Hardware Capabilities

Hardware Features	Fermi GPUs	Kepler GPUs	First Generation Maxwell GPUs	Second Generation Maxwell GPUs	Pascal GPUs
VC1 Simple, Main & Advanced profiles	✓	✓	✓	✓	✓
MPEG4 Simple and Advanced Simple Profiles	✓	✓	✓	✓	✓
MPEG2 Simple & Main profiles	✓	✓	✓	✓	✓
H.264 Baseline, Main, High Profiles	✓	✓	✓	✓	✓
VP8*	×	×	×	✓	✓
HEVC Main Profile**	×	×	×	✓	✓
VP9 Profile 0**	×	×	×	✓	✓
8192x8192 Decoding support (HEVC&VP9 only) ***	×	×	×	×	✓

\* : Present in Select Pascal GPUs and all Second Generation Maxwell GPUs

\*\* : Present in Select Maxwell Second Generation GPUs and all Pascal GPUs

\*\*\*: Present in Select Pascal GPUs

Table 2. New additions in the current SDK

New software features	Description
Support for Pascal GPUs	Support for Pascal GPUs
VP9 decoding	Software support for VP9 decoding Profile 0.
VP8 decoding	Software support for VP8 decoding.
HEVC & VP9 8K decoding	Software support for decoding HEVC & VP9 content with resolution as high as 8192 × 8192.
Additional sample applications	New sample application to demonstrate interoperability between D3D11 and CUDA.

### 3. NVDEC PERFORMANCE

NVDEC natively supports multiple hardware decoding contexts with negligible context-switching penalty. As a result, subject to the hardware performance limit and available memory, an application can decode multiple videos simultaneously.

The hardware and software maintain the context for each decoding session, allowing a large number of simultaneous decoding sessions to run in parallel. Table 3 provides an indicative data about the decoding performance of NVDEC across Kepler, Maxwell and Pascal GPU architectures for HEVC and H.264 encoded bitstream (approximately at 20 Mbps), at resolution of 1920 × 1080 and decoded frames in YUV 4:2:0 8-bit format.

Table 3. NVDEC hardware indicative decoding performance

GPU Architecture	Codec	Performance in frames/second
Kepler	H.264	161
	HEVC	NA*
First Generation Maxwell	H.264	376
	HEVC	NA*
Second Generation Maxwell	H.264	392
	HEVC	408
Pascal	H.264	658
	HEVC	720

\*Codec is not supported on the hardware

## 4. PROGRAMMING NVDEC

Video Codec SDK 7.0 is supported on R367 drivers and above (see readme and release notes included in the SDK package).

Various capabilities of NVDEC are exposed to the application software via the NVIDIA proprietary application programming interface (NVDEC API). Please refer to the Video Decoder Programming guide and the Reference Manual for details on using these APIs.

For a complete list of GPUs supporting hardware accelerated decoding please refer to <https://developer.nvidia.com/nvidia-video-codec-sdk>.

## **Notice**

ALL NVIDIA DESIGN SPECIFICATIONS, REFERENCE BOARDS, FILES, DRAWINGS, DIAGNOSTICS, LISTS, AND OTHER DOCUMENTS (TOGETHER AND SEPARATELY, "MATERIALS") ARE BEING PROVIDED "AS IS." NVIDIA MAKES NO WARRANTIES, EXPRESSED, IMPLIED, STATUTORY, OR OTHERWISE WITH RESPECT TO THE MATERIALS, AND EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE.

Information furnished is believed to be accurate and reliable. However, NVIDIA Corporation assumes no responsibility for the consequences of use of such information or for any infringement of patents or other rights of third parties that may result from its use. No license is granted by implication of otherwise under any patent rights of NVIDIA Corporation. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all other information previously supplied. NVIDIA Corporation products are not authorized as critical components in life support devices or systems without express written approval of NVIDIA Corporation.

## **Trademarks**

NVIDIA, the NVIDIA logo, GeForce, Quadro, Tesla, and NVIDIA GRID are trademarks and/or registered trademarks of NVIDIA Corporation in the U.S. and other countries. Other company and product names may be trademarks of the respective companies with which they are associated.

## **Copyright**

© 2011-2016 NVIDIA Corporation. All rights reserved.