NVIDIA DRIVE OS 5.1 to 6.0 SDK Migration Guide

Version: 6.0.4
## Document History

**SWE-SWDOCDRV-017-PGRF**

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Description of Change</th>
</tr>
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<tbody>
<tr>
<td>01</td>
<td>August 1, 2021</td>
<td>Initial release</td>
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<tr>
<td>02</td>
<td>August 16, 2021</td>
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</table>
• Added Installation and Tools Changes chapter  
• Added NvMedia API Changes section  
• Added Drive Update Changes section  
• Added the following sections to the TensorRT content:  
  > Symbols  
  > Plugins and Plugin Registry  
  > Library Names  

| 03      | August 24, 2021   | In the TensorRT API Changes section, added information about a build flag to enable safety restrictions and a method check for IBuilder.                                                                                                                                                                                                                                                                                                                      |
| 04      | September 30, 2021|  
• Incorporated major content and organizational changes to NvMedia API tables  
• Incorporated updates to the TensorRT API Changes section  
• Updated the last four rows in the SDK File Locations in 5.2 and 6.0 table  

| 05      | December 16, 2021 |  
• Updated content in the NvStreams API Changes section  
• Updated the Tensor RT API Changes section to rename the section and remove content now found in the release notes.  
• Added a table: TensorRT Changes for 6.0.1 and 6.0.2  

| 06      | January 21, 2022  |  
• Added the following sections:  
  > NvMedia Image Processing Pipeline (IPP) Changes Introduced in DRIVE OS 5.1.15.0  
  > NvMedia 2D: Migrating from 5.2 to 6.0  
  > NvMedia Lens Distortion Correction (LDC): Migrating from 5.2 to 6.0  
• Updated tables in the Changes to PCT section  
• Updated TensorRT information  
• Implemented editorial updates  

| 07      | February 11, 2022 |  
• Added a timeline summary of NvMedia API changes  

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<table>
<thead>
<tr>
<th></th>
<th>March 10, 2022</th>
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<tr>
<td>08</td>
<td>• Added the NvScilpc API Changes section</td>
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<table>
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<tr>
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<th>April 12, 2022</th>
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</table>
| 09 | • Added the Linux targetfs directory to targetfs image section  
    • Added information about a TensorRT API |

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
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| 10 | • Added PKCS#11 API Changes section  
    • Added Board Support Packages (BSP) API Changes  
    • Added a Utilities section  
    • Updated the NvScilpc API Changes section for 6.0.4  
    • Updated the NvMedia Core Deprecation section  
    • Added NvMedia Tensor API Changes section |
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Note: NVIDIA DRIVE OS 5.2 - 6.0 is currently in development. As a result, this document describes pre-production data; all content is subject to change. System development using pre-production data comes with inherent risk that should be understood by system developers.

This document summarizes the changes you can expect moving from NVIDIA DRIVE OS 5.1 and 5.2 to 6.0. While NVIDIA DRIVE Xavier™ supports DRIVE OS 5.2, NVIDIA DRIVE Orin™, our next-generation System on a Chip (SoC) for Automotive and Safety, supports DRIVE 6.0.

This migration guide is designed to help you plan early to migrate your applications for a seamless experience when you gain access to Orin development and reference production boards starting with 6.0 releases.

The following figure identifies component changes between 5.2 and 6.0.

**WHAT’S NEW?**

In DRIVE OS 6

<table>
<thead>
<tr>
<th>DRIVE Components</th>
<th>DRIVE OS 5.2</th>
<th>DRIVE OS 6.0</th>
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<tr>
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<td>18.04</td>
<td>20.04</td>
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<td>Ubuntu Target Root File System</td>
<td>4.14</td>
<td>5.10</td>
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<td>Linux Kernel¹</td>
<td>7.0.4</td>
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<td>Blackberry QNX SDP²</td>
<td>2.1</td>
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<td>GCC Toolchain</td>
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<td>C++ Feature Set</td>
<td>5.4</td>
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<td>cuDNN</td>
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<td>1.0</td>
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<td>QNX Screen</td>
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<td></td>
<td>7.1.1</td>
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<td>PKCS#11</td>
<td>v¹</td>
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<table>
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<th>DRIVE OS 6.1</th>
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<th>DRIVE OS 6.1</th>
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<th>Other</th>
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<tr>
<td>Packaging</td>
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<td>Debian/Docker</td>
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<tr>
<td>Distribution</td>
<td>NVONLINE</td>
<td>NGC</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1) Linux only, not available on QNX
2) QNX only, not available on Linux
3) GCC toolchain will be either 9.2 or 9.3.
4) First version number TBD

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With the NVIDIA DRIVE OS 6.0 release, you can expect changes to the following:

- Packaging
- Installation and Tools
- Utilities
- The SDK Structure
- Safety Services
- APIs
DRIVE OS 5.2 to 6.0 Packaging Changes

Note: This document is provided as a preview of upcoming changes; version numbers and file names are subject to change.

Note: This document is not 5.2 specific. Debian packages are not supported for external consumption.

Release 6.0 includes packaging changes from 5.2. This document describes the transition from .run files to .deb files for Standard and Safety releases.

The following Debian package files remain unchanged from 5.2 to 6.0:

Note: The versions will be updated from 10.2 to 11.x.

- Developer Tools
  - NsightSystems-linux-nda-2021.2.2.3-9b295cc.deb and NVIDIA_Nsight_Graphics_D5Q_NDA_2020.5.20339.deb

- NVIDIA CUDA®
  - cuda-repo-cross-aarch64-qnx-standard-<cuda_version>-local_<cuda_version>._build_version>_all.deb
  - cuda-repo-cross-qnx-safe-<cuda_version>-local_<cuda_version>._build_version>_all.deb
  - cuda-repo-minimal-toolkit-<cuda_version>-local_<cuda_version>._build_version>_amd64.deb
  - cuda-repo-qnx-<cuda_version>-local_<cuda_version>._build_version>_amd64.deb
  - cuda-repo-ubuntu1804-<cuda_version>-local_<cuda_version>._build_version>_450.118-1_amd64.deb

- cuDNN
  - cudnn-local-repo-ubuntu[VERSION]_arm64.deb
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- cudnn-local-repo-ubuntu{VERSION}_amd64.deb
- cudnn-local-repo-cross-aarch64-d5l-{VERSION}_all.deb
- cudnn-local-repo-cross-aarch64-qnx-{VERSION}.{BUILD}_all.deb

TensorRT
- nv-tensorrt-repo-ubuntu1804-{CUDA_VERSION}-trt{VERSION}-x86-host-ga-{BUILD}_amd64.deb
- nv-tensorrt-repo-ubuntu1804-{CUDA_VERSION}-trt{VERSION}-d5l-target-ga-{BUILD}_arm64.deb
- nv-tensorrt-repo-ubuntu1804-{CUDA_VERSION}-trt{VERSION}-d5l-cross-ga-{BUILD}_amd64.deb
- nv-tensorrt-repo-ubuntu1804-{CUDA_VERSION}-trt{VERSION}-qnx-cross-ga-{BUILD}_amd64.deb
- libnvinfer-safe6-cross-qnx-safety_{VERSION}+{CUDA_VERSION}_all.deb

The following table describes variables used in this document:

<table>
<thead>
<tr>
<th>Field</th>
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<tr>
<td>DrivePlatform</td>
<td>Yes</td>
<td>driveos</td>
</tr>
<tr>
<td>Flavor</td>
<td>Yes, but applicable only for Master Debian packages</td>
<td>flash, build</td>
</tr>
<tr>
<td>OS</td>
<td>Yes</td>
<td>common</td>
</tr>
<tr>
<td>DriveType</td>
<td>Yes</td>
<td>safety, standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In the case of “standard”, this field will not be populated, and without adjacent dashes</td>
</tr>
<tr>
<td>Module</td>
<td>Yes, only for shell and leaf Debian packages</td>
<td>Component name</td>
</tr>
<tr>
<td>PDK</td>
<td>Yes, for Master and optional for leaf and shell Debian packages</td>
<td>sdk, pdk</td>
</tr>
<tr>
<td>DriveVersion</td>
<td>Yes</td>
<td>{RELEASE}-{GCID}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For example, 5.2.x.0-GCID, 6.x.0.0-GCID</td>
</tr>
</tbody>
</table>

Master Debian Packages

Note: NVIDIA DRIVE™ OS Software Development Kit (SDK) is used to develop DRIVE OS applications for deployment on NVIDIA DRIVE AGX™ based

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Master Debian package files for SDKs.

- NVIDIA DRIVE™ OS Platform Development Kit (PDK) is used to adapt NVIDIA DRIVE OS to run on custom hardware based on NVIDIA Automotive SoC (that is Xavier). NVIDIA provides the flexibility to install up to the leaf from Master for PDKs.

Not all developers have access to all DRIVE OS components. For more information, contact your NVIDIA representative.

### Linux

#### Table 2. Master Debian Package Names (Linux)

<table>
<thead>
<tr>
<th>Master Debian Package File Names</th>
<th>Master Debian Package Names</th>
</tr>
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<tbody>
<tr>
<td>nv-driveos-build-{DriveType}-sdk-linux_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-build-{DriveType}-sdk-linux-{DriveVersion}</td>
</tr>
<tr>
<td>nv-driveos-flash-{DriveType}-sdk-linux_{DriveVersion}_amd64.deb</td>
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### QNX (Standard)

#### Table 3. Master Debian Package Names (QNX Standard)

<table>
<thead>
<tr>
<th>Master Debian Package File Names</th>
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<td>nv-driveos-build-{DriveType}-sdk-qnx_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-build-{DriveType}-sdk-qnx-{DriveVersion}</td>
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<td>nv-driveos-flash-{DriveType}-sdk-qnx_{DriveVersion}_amd64.deb</td>
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<tr>
<td>nv-driveos-build-{DriveType}-debug-sdk-qnx_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-build-{DriveType}-debug-sdk-qnx-{DriveVersion}</td>
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</table>
### Foundation (Standard)

The following table describes the 5.2 to 6.0 Standard Foundation transition:

#### Table 4. Standard Foundation .run File to .deb File Map

<table>
<thead>
<tr>
<th>Existing Runfile</th>
<th>Shell Debian Package File Name</th>
<th>Leaf Debian Package File Names</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>drive-t186ref-foundation-</code></td>
<td><code>nv-driveos-foundation-</code></td>
<td><code>nv-driveos-foundation-</code></td>
</tr>
<tr>
<td><code>(DriveVersion)-toolchain.run</code></td>
<td><code>(DriveType)_toolchains_{ToolVersion}_amd64.deb</code></td>
<td><code>(DriveType)_gcc-linaro-aarch64-linux-gnu_{DriveVersion}_amd64.deb</code></td>
</tr>
<tr>
<td></td>
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<td><code>nv-driveos-foundation-</code></td>
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<tr>
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<td></td>
<td><code>(DriveType)_gcc-linaro-arm-linux-gnueabi_{DriveVersion}_amd64.deb</code></td>
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<tr>
<td></td>
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<td><code>nv-driveos-foundation-</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td>`(DriveType)<em>gcc-linaro-arm-linux-gnueabihf</em>{DriveVersion}_amd64.deb</td>
</tr>
<tr>
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<tr>
<td><code>drive-t186ref-foundation-</code></td>
<td><code>nv-driveos-foundation-</code></td>
<td><code>nv-driveos-foundation-</code></td>
</tr>
<tr>
<td><code>(DriveVersion)-release-sdk.run</code></td>
<td><code>(DriveType)_release-sdk_{DriveVersion}_amd64.deb</code></td>
<td><code>(DriveType)_release-sdk-list_{DriveVersion}_amd64.deb</code></td>
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<tr>
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<td><code>(DriveType)_release-sdk-core-flash-data_{DriveVersion}_amd64.deb</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>nv-driveos-foundation-</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>(DriveType)_release-sdk-core-flash-</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing Runfile</td>
<td>Shell Debian Package File Name</td>
<td>Leaf Debian Package File Names</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>tools_{DriveVersion}_amd64</td>
<td>nv-driveos-foundation-(DriveType)-release-sdk-flash-data_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td>4.deb</td>
<td>nv-driveos-foundation-(DriveType)-release-sdk-flash-tools_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-foundation-oss-src.run</td>
<td>N/A</td>
<td>nv-driveos-foundation-(DriveType)-oss-src_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-foundation-{DriveVersion}-debug-overlay.run</td>
<td>N/A</td>
<td>nv-driveos-foundation-(DriveType)-debug-overlay_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-foundation-{DriveVersion}-e3550specific.run</td>
<td>N/A</td>
<td>None - use e3550 specific .zip files containing FW directly</td>
</tr>
<tr>
<td>drive-t186ref-foundation-{DriveVersion}-p3479specific.run</td>
<td>N/A</td>
<td>None - use p3479 specific .zip files containing FW directly</td>
</tr>
</tbody>
</table>

### Linux (Standard)

The following table describes the 5.2 to 6.0 Standard Linux transition:

Table 5. Standard Linux .run File to .deb File Map

<table>
<thead>
<tr>
<th>Existing Runfile</th>
<th>Shell Debian Package File Name</th>
<th>Leaf Debian Package File Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>drive-t186ref-linux-{DriveVersion}-oss-minimal-sdk.run</td>
<td>nv-driveos-linux-oss-minimal-sdk_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-linux-oss-minimal-sdk-kernel_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>Existing Runfile</td>
<td>Shell Debian Package File Name</td>
<td>Leaf Debian Package File Names</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>nv-driveos-linux-oss-minimal-sdk-kernel-rt-patches_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-linux-oss-minimal-sdk-core_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-linux-{DriveVersion}-oss-src.run</td>
<td>N/A</td>
<td>nv-driveos-linux-oss-src_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-linux-{DriveVersion}-initramfs.run</td>
<td>N/A</td>
<td>nv-driveos-linux-initramfs_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-linux-{DriveVersion}-nv-minimal-sdk.run</td>
<td>nv-driveos-linux-nv-minimal-sdk_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-linux-nv-minimal-sdk-target_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-linux-nv-minimal-sdk-bin-core_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-linux-nv-minimal-sdk-base_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-linux-nv-minimal-sdk-usermode-multimedia_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-linux-nv-minimal-sdk-usermode-compute_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-linux-nv-minimal-sdk-usermode-nvsci_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>Existing Runfile</td>
<td>Shell Debian Package File Name</td>
<td>Leaf Debian Package File Names</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>drive-tl86ref-linux-{DriveVersion}-dds.run</td>
<td>nv-driveos-linux-dds_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-linux-graphics_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-tl86ref-linux-{DriveVersion}-dds.run</td>
<td>nv-driveos-linux-dds_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-linux-usermode-buildkit_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-tl86ref-linux-{DriveVersion}-nvros.run</td>
<td>N/A</td>
<td>nv-driveos-linux-nvros_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-tl86ref-linux-{DriveVersion}-dpx-patch-v0.0.run</td>
<td>None - Must be able to cleanly apply new shell/leaf .debs individually for patch updates</td>
<td>nv-driveos-linux-dpx-patch_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-tl86ref-linux-{DriveVersion}-driveos-core-rfs.run</td>
<td>N/A</td>
<td>nv-driveos-linux-driveos-core-rfs_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-tl86ref-linux-{DriveVersion}-driveos-oobe-rfs.run</td>
<td>N/A</td>
<td>nv-driveos-linux-driveos-oobe-rfs_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-tl86ref-linux-{DriveVersion}-nv-core-rfs.run</td>
<td>N/A</td>
<td>nv-driveos-linux-nv-core-rfs_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>nvidia-driveos-{DriveVersion}-copytarget.deb</td>
<td>N/A</td>
<td>nv-driveos-linux-{DriveType}-copytarget-{DriveVersion}_amd64.deb</td>
</tr>
</tbody>
</table>
### QNX (Standard)

The following table describes the 5.2 to 6.0 Standard QNX transition:

<table>
<thead>
<tr>
<th>Existing Runfile</th>
<th>Shell Debian Package File Name</th>
<th>Leaf Debian Package File Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>nvidia-driveos-{DriveVersion}-buildkit.deb</td>
<td>N/A</td>
<td>nv-driveos-linux-{DriveType}-buildkit-{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-qnx-{DriveVersion}-tegra2aurix_updater.run</td>
<td>N/A</td>
<td>nv-driveos-qnx-{DriveType}-tegra2aurix-updater_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-qnx-{DriveVersion}-dds.run</td>
<td>N/A</td>
<td>nv-driveos-qnx-{DriveType}-dds_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-qnx-&lt;REL&gt;-&lt;GCID&gt;-driver-sdk.run</td>
<td>nv-driveos-qnx-driver-sdk_{DriveVersion}_amd64.deb</td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-base_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-usermode-multimedia_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-usermode-compute_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-usermode-nvsci_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-s...</td>
</tr>
<tr>
<td>Existing Runfile</td>
<td>Shell Debian Package File Name</td>
<td>Leaf Debian Package File Names</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>drive-t186ref-qnx-{DriveVersion} - tensorrt-qnx.run</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>drive-t186ref-qnx-{DriveVersion} - tgv.run</td>
<td>N/A</td>
<td>nv-driveos-qnx-(DriveType)-tgv_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-qnx-{DriveVersion} - nvsomeip.run</td>
<td>N/A</td>
<td>nv-driveos-qnx-(DriveType)-nvsomeip_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>nvidia-driveos-{DriveVersion} - driveos-qnx-fs.deb</td>
<td>N/A</td>
<td>nv-driveos-qnx-(DriveType)-fs-{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>nvidia-driveos-{DriveVersion} - copytarget.deb</td>
<td>N/A</td>
<td>nv-driveos-qnx-(DriveType)-copytarget-{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>nvidia-driveos-{DriveVersion} - buildkit.deb</td>
<td>N/A</td>
<td>nv-driveos-qnx-(DriveType)-buildkit-{DriveVersion}_amd64.deb</td>
</tr>
</tbody>
</table>

### QNX (Safety)

The following table describes the 5.2 to 6.0 Safety QNX transition:

<table>
<thead>
<tr>
<th>Existing Runfile</th>
<th>Shell Debian Package File Name</th>
<th>Leaf Debian Package File Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>drive-t186ref-qnx-{REL}&gt;-{GCID}&gt;-driver-sdk.run</td>
<td>N/A</td>
<td>nv-driveos-qnx-(DriveType)-nv-minimal-sdk-</td>
</tr>
<tr>
<td>Existing Runfile</td>
<td>Shell Debian Package File Name</td>
<td>Leaf Debian Package File Names</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Existing Runfile</td>
<td>nv-driveos-qnx-driver-sdk_{DriveVersion}_amd64.deb</td>
<td>base_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-usermode-multimedia_{DriveVersion}_amd64.deb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-usermode-compute_{DriveVersion}_amd64.deb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-usermode-nvsci_{DriveVersion}_amd64.deb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-usermode-graphics_{DriveVersion}_amd64.deb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>nv-driveos-qnx-{DriveType}-nv-minimal-sdk-usermode-buildkit_{DriveVersion}_amd64.deb</td>
<td></td>
</tr>
<tr>
<td>drive-t186ref-qnx-{DriveVersion}-tensortt-qnx.run</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>drive-t186ref-qnx-{DriveVersion}-tgv.run</td>
<td>N/A</td>
<td>nv-driveos-qnx-{DriveType}-tgv_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>drive-t186ref-qnx-{DriveVersion}-debug-overlay.run</td>
<td>N/A</td>
<td>nv-driveos-qnx-{DriveType}-debug-overlay_{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>nvidia-driveos-{DriveVersion}-driveos-qnx-safety-fs.deb</td>
<td>N/A</td>
<td>nv-driveos-qnx-{DriveType}-fs-{DriveVersion}_amd64.deb</td>
</tr>
</tbody>
</table>
### Existing Runfile

<table>
<thead>
<tr>
<th>Existing Runfile</th>
<th>Shell Debian Package File Name</th>
<th>Leaf Debian Package File Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>nvidia-driveos-</td>
<td>N/A</td>
<td>nv-driveos-qnx-{DriveType}-debug-fs-{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>(DriveVersion)-driveos-qnx-safety-debug-fs.deb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nvidia-driveos-</td>
<td>N/A</td>
<td>nv-driveos-qnx-{DriveType}-copytarget-{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>(DriveVersion)-copytarget.deb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nvidia-driveos-</td>
<td>N/A</td>
<td>nv-driveos-qnx-{DriveType}-buildfs-{DriveVersion}_amd64.deb</td>
</tr>
<tr>
<td>(DriveVersion)-buildkit.deb</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Common

The following table describes the 5.2 to 6.0 transition for files common to both Linux and QNX:

**Table 8. Common .run File .deb File Map**

<table>
<thead>
<tr>
<th>Existing Runfile</th>
<th>Shell Debian Package File Name</th>
<th>Leaf Debian Package File Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>nvidia-driveos-</td>
<td>N/A</td>
<td>nv-driveos-common-{DriveType}-copytarget-{Version}_amd64.deb</td>
</tr>
<tr>
<td>(DriveVersion)-copytarget.deb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nvidia-driveos-</td>
<td>N/A</td>
<td>nv-driveos-common-{DriveType}-build-fs-{Version}_amd64.deb</td>
</tr>
<tr>
<td>(DriveVersion)-buildkit.deb</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Installation and Tools Changes

**Linux targetfs directory to targetfs image**

- DRIVE OS Linux defaults to using targetfs image [EXT4 image] while flashing the target.
  - For example, `<NV_WORKSPACE>/drive-linux/filesystem/targetfs.img` will be flashed as the `Linux rootfs` instead of `<NV_WORKSPACE>/drive-linux/filesystem/targetfs/`

- File additions and modifications required to reflect in the target need to occur by editing the EXT4 image using one of the following ways.
  - Using Build-FS tool (Recommended). For additional information, refer to the following topics in the NVIDIA DRIVE OS 6.0 Linux SDK Developer Guide.
    - Editing NVIDIA Build-FS CONFIG
    - Executing NVIDIA Build-FS With the Updated CONFIG
    - Flashing the Customized Target Filesystem
  - Editing of `<NV_WORKSPACE>/drive-linux/filesystem/targetfs.img`:
    1. `mkdir /tmp/mount`
    2. `sudo mount <NV_WORKSPACE>/drive-linux/filesystem/targetfs.img /tmp/mount`
    3. Make minor edits in /tmp/mount
    4. `sudo umount /tmp/mount`
      - This is only possible for small edits as the targetfs.img free space is limited

- Debian to install the filesystem in DRIVE OS Linux has been updated from:
  `nv-driveos-linux-<fs_variant>-tar-extract-<release>-<gcid>_<release>-<gcid>_amd64.deb` to `nv-driveos-linux-<fs_variant>-<release>-<gcid>_<release>-<gcid>_amd64.deb`

Where

- `<fs_variant>` is one from `(driveos-core-ubuntu-20.04-rfs, driveos-oobe-ubuntu-20.04-rfs, driveos-oobe-desktop-ubuntu-20.04-rfs),`
- `<release>` is the DRIVE OS RELEASE
- `<gcid>` is the DRIVE OS GCID
To ensure backwards compatibility and allow a smooth transition, DRIVE OS Linux still creates the `<NV_WORKSPACE>/drive-linux/filesystem/targetfs/` directory when the new Debian package is installed.

- If `<NV_WORKSPACE>/drive-linux/filesystem/targetfs/` is not available in your installation, ensure your system supports loop mounting [Ubuntu Manpage: losetup - set up and control loop devices](https://help.ubuntu.com/manpages/bionic/en/losetup) and run the following commands for manual mount of Ext4 image:

  ```bash
  mkdir -p /tmp/mount
  sudo mount -t ext4 <NV_WORKSPACE>/drive-linux/filesystem/targetfs.img /tmp/mount
  sudo cp -a /tmp/mount/. <NV_WORKSPACE>/drive-linux/filesystem/targetfs/
  ```

Optional Debian packages on installation will update both `<NV_WORKSPACE>/drive-linux/filesystem/targetfs.img` and `<NV_WORKSPACE>/drive-linux/filesystem/targetfs/` directory.

- The directory `<NV_WORKSPACE>/drive-linux/filesystem/targetfs/` is supported in DRIVE OS for the entire DRIVE OS 6.0.x release cycle.

- To revert PCT to pick up `rootfs` contents from `<NV_WORKSPACE>/drive-linux/filesystem/targetfs/` similar to behavior in previous releases:
  - After bind partitions such as `make -f Makefile.bind`, run `<NV_WORKSPACE>/drive-foundation/tools/misc/use_rootfs_img.sh -r`

## Toolchain Upgrade

Toolchain in DRIVE OS cross compilation is upgrading from GCC 7.3.1 to GCC 9.3.0, and the Toolchain vendor is changing from Linaro to Bootlin.

### Table 9. Legacy Toolchain and Replacement Toolchain

<table>
<thead>
<tr>
<th>Legacy Toolchain in DRIVE OS 5.2</th>
<th>Replacement Toolchain in DRIVE OS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;INSTALL_DIR&gt;/toolchains/gcc-linaro-7.3.1-2018.05-x86_64_aarch64-linux-gnu</code></td>
<td><code>&lt;INSTALL_DIR&gt;/toolchains/aarch64--glibc--stable-2020.08-1</code></td>
</tr>
<tr>
<td><code>&lt;INSTALL_DIR&gt;/toolchains/gcc-linaro-7.3.1-2018.05-x86_64_arm-linux-gnueabihf</code></td>
<td><code>&lt;INSTALL_DIR&gt;/toolchains/armv7-eabihf--glibc--stable-2020.08-1</code></td>
</tr>
<tr>
<td><code>&lt;INSTALL_DIR&gt;/toolchains/gcc-linaro-7.3.1-2018.05-x86_64_arm-linux-gnueabi</code></td>
<td><code>&lt;INSTALL_DIR&gt;/toolchains/armv5-eabi--glibc--stable-2020.08-1</code></td>
</tr>
</tbody>
</table>

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You can install the new toolchains in DRIVE OS two different ways.

- **Runfile Installation:** drive-<NVPLATFORM>-foundation-<VERSION>-toolchain.run installs the new toolchain binaries.

- **Debian Installation:** Three new Debian packages are available to install the individual toolchains:
  - `nv-driveos-foundation-gcc-bootlin-gcc9.3-aarch64--glibc--stable-2020.08-1_9.3.0_amd64.deb`
  - `nv-driveos-foundation-gcc-bootlin-gcc9.3-armv5-eabi--glibc--stable-2020.08-1_9.3.0_amd64.deb`
  - `nv-driveos-foundation-gcc-bootlin-gcc9.3-armv7-eabihf--glibc--stable-2020.08-1_9.3.0_amd64.deb`

  These can be installed using the APT package manager and by providing the `NV_WORKSPACE` value when prompted. (Refer to the installation documentation for more details)

- Bind partitions using `Makefile.bind` on the user side require the updated aarch64 toolchain `[aarch64--glibc--stable-2020.08-1/]

- Rebuild of QB and Kernel from DRIVE OS require the updated aarch64 toolchain `[aarch64--glibc--stable-2020.08-1/]

- Rebuild the entire software stack with the updated toolchain instead of mixing toolchain versions.

- Shared libraries [.so] generated with older compilers are theoretically compatible and linkable with the current toolchain.
  - However, shared libraries [.so] generated with new toolchain can be incompatible when linked with the older toolchain due to references to newer library APIs in the `.so`

**Ubuntu Upgrade**

The Ubuntu distribution version was upgraded from 18.04 to 20.04.

You have two different installation options.

- **Runfile Installation:**
  - Select either `driveos-core-rfs` or `driveos-oobe-rfs`.
  - Install the run file depending on core/oobe RFS respectively:
    - `drive-<NVPLATFORM>-linux-<VERSION>-driveos-oobe-ubuntu-20.04-rfs.run`
    - `drive-<NVPLATFORM>-linux-<VERSION>-driveos-core-ubuntu-20.04-rfs.run`

- **Debian Installation:**
  - NVIDIA provides two Debian packages.
The Debian packages are installable side-by-side. Filesystem images of core/oobe, respectively, are as follows:

> /opt/nvidia/driveos/6.0.0.0/filesystems/driveos-core-ubuntu-20.04-rfs/driveos-core-ubuntu-20.04-rfs.img
> /opt/nvidia/driveos/6.0.0.0/filesystems/driveos-oobe-ubuntu-20.04-rfs/driveos-oobe-ubuntu-20.04-rfs.img

Ubuntu 20.04, no longer provides the package python. You must install python2 or python3 and execute it as such.

- sudo apt install python2 python3
- python2
- python3

Some pip plugins are retired and will not work with python2. For developing new applications, use python3 instead of python2.
Utilities

Migration QNX IOLauncher config File to Device Tree

For integration with DRIVEOS State Management, all processes must start from the startup command device tree.

Device Tree property details is described in “Starting process from the device tree” section of IOLauncher utility manual. For more information, refer to the IOLauncher topic in the NVIDIA DRIVE OS 6.0 PDK for QNX or Linux.

Each command line in the IOLauncher config file migrates as cmd property of each command node in the startup command device node. cmd property has the same command line string as the source config file.

IOLauncher executes the commands sequentially, as listed in start_seq property the order of command nodes does not affect the execution sequence.

critical_process property is yes if the command has the --critical iolauncher option. Otherwise, the property is no.

heartbeat and oneshot are reserved properties for the future. They have no impact on any behavior.

sc7 property has a corresponding value as described in the IOLauncher utility manual.

Table 10: Startup Command DT Files

<table>
<thead>
<tr>
<th>DT Files</th>
<th>Applicable to</th>
</tr>
</thead>
<tbody>
<tr>
<td>tegra234-startupcmds-gos0-safety.dtsi</td>
<td>QNX Safety GOS0 VM</td>
</tr>
<tr>
<td>tegra234-startupcmds-gos0.dtsi</td>
<td>QNX Standard GOS0 VM</td>
</tr>
<tr>
<td>tegra234-startupcmds-gos1-safety.dtsi</td>
<td>QNX Safety GOS1 VM</td>
</tr>
<tr>
<td>tegra234-startupcmds-gos1.dtsi</td>
<td>QNX Standard GOS1 VM</td>
</tr>
</tbody>
</table>
SDK Structure

DRIVE OS 6.0 presents an improved directory structure and file layout over previous versions. The SDK contents are presented in a more organized fashion, making files more discoverable. Related files for a particular area of functionality are now localized to a single location.

New Top-Level Directories

New top-level directories are used to localize all related files to a single directory. In previous versions of DRIVE OS, these contents were scattered across multiple locations.

- **filesystem/** contains all files related to the population of the target filesystem for a Guest OS.
- **tools/** contains all tools, scripts, and utilities intended to run on the host.
- **kernel/** contains all files related to the Linux kernel.
- **platform-config/** contains all files related to platform configuration.
- **firmware/** contains all files that can be categorized as firmware.

There are some cases where specific files might fall into more than one area of functionality. In those cases, the files were placed into the most appropriate location.

**t186ref Removal from the SDK Installation Directory and File Names**

The t186 Tegra chip is no longer supported in DRIVE OS 6.0 SDK. Furthermore, the DRIVE OS SDK is designed to support multiple Tegra chips, so no one chip should be in the SDK name.

This change is expected to have a large impact on customers who used prior releases of DRIVE OS. The runfile names previously containing drive-t186ref-foundation, drive-t186ref-linux and drive-t186ref-qnx will now contain drive-foundation, drive-linux, and drive-qnx. Similarly, the top-level installation directories, previously drive-t186ref-foundation/, drive-t186ref-linux/, and drive-t186ref-qnx/, are now drive-foundation/, drive-linux/, and drive-qnx/.
Customers who wrote installation scripts, test scripts, Makefiles, documentation pages, or other files referencing the old SDK names will need to make modifications to use the new names. The t186 chip is no longer supported in DRIVE OS 6.0 SDK. Furthermore, the DRIVE OS SDK is designed to be able to support multiple chips, so no one chip should be in the SDK name.

**SDK File Locations in 5.2 and 6.0**

The following table describes how file locations have changed between 5.2 and 6.0:

<table>
<thead>
<tr>
<th></th>
<th>DRIVE OS 5.2</th>
<th>DRIVE OS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filesystem</td>
<td>Drive-t186ref-linux/</td>
<td>Filesystem/contents/bin/*</td>
</tr>
<tr>
<td>bin-target/*</td>
<td>filesystem/contents/config/x11/</td>
<td></td>
</tr>
<tr>
<td>data/conf/*.conf</td>
<td>filesystem/initramfs.cpio</td>
<td></td>
</tr>
<tr>
<td>kernel-rt_patches/yocto-tegra-initramfs-rootfs.img</td>
<td>modules/*rules</td>
<td></td>
</tr>
<tr>
<td>modules/**.rules</td>
<td>filesystem/contents/config/startup/</td>
<td></td>
</tr>
<tr>
<td>modules/scripts/*</td>
<td>filesystem/contents/config/startup/scripts/</td>
<td></td>
</tr>
<tr>
<td>OOBE/lib/systemd/system/drive-setup.service</td>
<td>filesystem/contents/config/OOBE/</td>
<td></td>
</tr>
<tr>
<td>targetfs-pkgs/filesystem.tar.bz2</td>
<td>filesystem/targetfs-pkgs/filesystem.tar.bz2</td>
<td></td>
</tr>
<tr>
<td>target-images/debians/*.*deb</td>
<td>filesystem/contents/debians/</td>
<td></td>
</tr>
<tr>
<td>targetfs-images/(*.img and MANIFEST.json)</td>
<td>filesystem/targetfs-images/(*.img and MANIFEST.json)</td>
<td></td>
</tr>
<tr>
<td>targetfs/</td>
<td>filesystem/targetfs/</td>
<td></td>
</tr>
<tr>
<td>utils/nvpmodel/*</td>
<td>filesystem/contents/ (various subdirectories)</td>
<td></td>
</tr>
<tr>
<td>utils/scripts/copytarget/manifest/*.*yaml</td>
<td>filesystem/copytarget/manifest/*.*yaml</td>
<td></td>
</tr>
<tr>
<td>vulkan/icd.d/nvidia_icd.json</td>
<td>filesystem/contents/config/vulkan/</td>
<td></td>
</tr>
<tr>
<td>rootfs-licenses.txt</td>
<td>filesystem/rootfs-licenses.txt</td>
<td></td>
</tr>
<tr>
<td>drive-t186ref-qnx/(standard)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bin-target/*</td>
<td>filesystem/contents/bin/*</td>
<td></td>
</tr>
</tbody>
</table>
### DRIVE OS 5.2  
### DRIVE OS 6.0

<table>
<thead>
<tr>
<th>Drive OS 5.2</th>
<th>Drive OS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>targetfs-images/*</td>
<td>filesystem/targetfs-images/*</td>
</tr>
<tr>
<td>build-fs-configs/driveos-qnx-fs.CONFIG.json</td>
<td>filesystem/build-fs/configs/driveos-qnx-fs.CONFIG.json</td>
</tr>
<tr>
<td>qnx_create_targetfs*.sh</td>
<td>filesystem/qnx_create_targetfs*.sh</td>
</tr>
<tr>
<td>rootfs-licenses.txt</td>
<td>filesystem/rootfs-licenses.txt</td>
</tr>
<tr>
<td>targetfs/</td>
<td>filesystem/targetfs/</td>
</tr>
<tr>
<td>utils/scripts/copytarget/manifest/*.yaml</td>
<td>filesystem/copytarget/manifest/*.yaml</td>
</tr>
<tr>
<td>vulkan/icd.d/nvidia_icd.json</td>
<td>filesystem/contents/config/vulkan/</td>
</tr>
<tr>
<td>drive-t186ref-qnx/ (safety)</td>
<td>filesystem/contents/bin/*</td>
</tr>
<tr>
<td>bin-target/*</td>
<td>filesystem/targetfs/images/*</td>
</tr>
<tr>
<td>targetfs.build_file</td>
<td>filesystem/targetfs.build_file</td>
</tr>
<tr>
<td>qnx_targetfs.img</td>
<td>filesystem/qnx_targetfs.img</td>
</tr>
<tr>
<td>targetfs-images/*</td>
<td>filesystem/targetfs-images/*</td>
</tr>
<tr>
<td>qnx_create_targetfs_safety*.sh</td>
<td>filesystem/qnx_create_targetfs_safety*.sh</td>
</tr>
<tr>
<td>rootfs-licenses.txt</td>
<td>filesystem/rootfs-licenses.txt</td>
</tr>
<tr>
<td>targetfs/</td>
<td>filesystem/targetfs/</td>
</tr>
<tr>
<td>utils/scripts/copytarget/manifest/*.yaml</td>
<td>filesystem/copytarget/manifest/*.yaml</td>
</tr>
</tbody>
</table>

#### Tools

<table>
<thead>
<tr>
<th>Tools 5.2</th>
<th>Tools 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>drive-t186ref-foundation/ (standard)</td>
<td></td>
</tr>
<tr>
<td>firmware/src/trusted_os/ta-dev/tools/eks_gen/*</td>
<td>tools/security/eks_gen/*</td>
</tr>
<tr>
<td>Makefile.bind</td>
<td>make/Makefile.bind</td>
</tr>
<tr>
<td>security/trusted-os/scripts/tools/nv_pkcs11_keywrap/*</td>
<td>tools/security/pkcs11/keywrap/*</td>
</tr>
<tr>
<td>security/trusted-os/scripts/tools/tos_gen/*</td>
<td>tools/security/tos_gen/*</td>
</tr>
<tr>
<td>tools/host/dtc/dtc</td>
<td>tools/device-tree/dtc</td>
</tr>
<tr>
<td>tools/host/delnode*</td>
<td>tools/device-tree/delnode*</td>
</tr>
<tr>
<td>tools/host/flashtools/*</td>
<td>tools/flashtools/*</td>
</tr>
<tr>
<td>tools/host/ist/*</td>
<td>tools/ist/*</td>
</tr>
<tr>
<td>tools/host/<em>muxer/</em></td>
<td>tools/muxer/*</td>
</tr>
<tr>
<td>DRIVE OS 5.2</td>
<td>DRIVE OS 6.0</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>tools/host/use_rootfs_img.sh</td>
<td>tools/misc/</td>
</tr>
<tr>
<td>virtualization/tools/eventlib/*</td>
<td>tools/perf/eventlib/*/</td>
</tr>
<tr>
<td>virtualization/tools/pctdump_x86/*</td>
<td>tools/pctdump/*/</td>
</tr>
<tr>
<td>drive-t186ref-foundation/</td>
<td></td>
</tr>
<tr>
<td>(safety)</td>
<td></td>
</tr>
<tr>
<td>Makefile.bind</td>
<td>make/Makefile.bind</td>
</tr>
<tr>
<td>security/trusted-os/scripts/tools/nv_pkcs11_keywrap/*</td>
<td>tools/security/pkcs11/keywrap/*</td>
</tr>
<tr>
<td>security/trusted-os/scripts/tools/tos_gen/*</td>
<td>tools/security/tos_gen/*</td>
</tr>
<tr>
<td>tools/host/dtc/dtc</td>
<td>tools/device-tree/dtc</td>
</tr>
<tr>
<td>tools/host/delnode*</td>
<td>tools/device-tree/*</td>
</tr>
<tr>
<td>tools/host/flashtools/*</td>
<td>tools/flashtools/*</td>
</tr>
<tr>
<td>tools/host/ist/*</td>
<td>tools/ist/*</td>
</tr>
<tr>
<td>drive-t186ref-linux/</td>
<td></td>
</tr>
<tr>
<td>utils/nv_edidgenerate</td>
<td>tools/nv_edidgenerate/nv_edidgenerate/*</td>
</tr>
<tr>
<td>utils/openGL-tools/glslc</td>
<td>tools/openGL-tools/glslc</td>
</tr>
<tr>
<td>utils/optin_fuse</td>
<td>tools/optin_fuse/</td>
</tr>
<tr>
<td>drive-t186ref-qnx/ (standard)</td>
<td></td>
</tr>
<tr>
<td>utils/asid_hash_calculator</td>
<td>tools/asid_hash/asid_hash_calculator</td>
</tr>
<tr>
<td>utils/emc_log</td>
<td>tools/emc_log/</td>
</tr>
<tr>
<td>utils/fpdlink_init/*</td>
<td>tools/fpdlink_init/*</td>
</tr>
<tr>
<td>utils/host/laptsa-imp</td>
<td>tools/laptsa-imp/laptsa-imp</td>
</tr>
<tr>
<td>utils/memusage</td>
<td>tools/memusage/memusage</td>
</tr>
<tr>
<td>utils/nvcanrtc/nvcanrtc</td>
<td>tools/nvcanrtc/nvcanrtc</td>
</tr>
<tr>
<td>utils/openGL-tools/glslc</td>
<td>tools/openGL-tools/glslc</td>
</tr>
<tr>
<td>utils/thermal_utils/*</td>
<td>tools/thermal_utils/*</td>
</tr>
<tr>
<td>drive-t186ref-qnx/ (safety)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Linux Kernel</td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>6.0</td>
</tr>
<tr>
<td>drive-t186ref-linux/</td>
<td></td>
</tr>
<tr>
<td>DRIVE OS 5.2</td>
<td>DRIVE OS 6.0</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>kernel-rt-patches/{Image, System.map, vmlinux}</td>
<td>kernel/preempt_rt/images/{Image, System.map, vmlinux}</td>
</tr>
<tr>
<td>kernel-rt-patches/modules/*</td>
<td>kernel/preempt_rt/modules/*</td>
</tr>
<tr>
<td>drive-oss-src/</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>kernel/source/oss_src/kernel</td>
</tr>
<tr>
<td></td>
<td>kernel/source/oss_src/nvgpu</td>
</tr>
<tr>
<td></td>
<td>kernel/source/oss_src/nvidia</td>
</tr>
<tr>
<td></td>
<td>kernel/source/oss_src/nvlink</td>
</tr>
<tr>
<td>hardware/</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>kernel/source/hardware</td>
</tr>
<tr>
<td><strong>Platform Config</strong></td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>6.0</td>
</tr>
<tr>
<td>Xavier (t19x) platform configuration files across multiple directories will be removed from DRIVE OS 6.0.</td>
<td>Orin (t23x) platform configuration files are localized to the platform-config/ directory in each SDK.</td>
</tr>
<tr>
<td><strong>Firmware</strong></td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>6.0</td>
</tr>
<tr>
<td>drive-t186ref-foundation/ (Standard and Safety)</td>
<td></td>
</tr>
<tr>
<td>firmwares/*</td>
<td>firmware/*</td>
</tr>
<tr>
<td>drive-t186ref-linux/</td>
<td></td>
</tr>
<tr>
<td>lib-target/&lt;firmware files&gt;</td>
<td>firmware/&lt;firmware files&gt;</td>
</tr>
<tr>
<td>drive-t186ref-qnx/ (Standard and Safety)</td>
<td></td>
</tr>
<tr>
<td>lib-target/&lt;firmware files&gt;</td>
<td>firmware/&lt;firmware files&gt;</td>
</tr>
<tr>
<td>nvidia-bsp/aarch64le/usr/lib/&lt;firmware files&gt;</td>
<td>firmware/&lt;firmware files&gt;</td>
</tr>
<tr>
<td><strong>t186ref Removal</strong></td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>6.0</td>
</tr>
<tr>
<td>drive-t186ref-foundation/ (Standard)</td>
<td>drive-foundation/</td>
</tr>
<tr>
<td>drive-t186ref-foundation/ (Safety)</td>
<td>drive-foundation-safety/</td>
</tr>
<tr>
<td>drive-t186ref-linux/</td>
<td>drive-linux/</td>
</tr>
<tr>
<td>DRIVE OS 5.2</td>
<td>DRIVE OS 6.0</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>drive-t186ref-qnx/ (Standard)</td>
<td>drive-qnx/</td>
</tr>
<tr>
<td>drive-t186ref-qnx/ (Safety)</td>
<td>drive-qnx-safety/</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>drive-t186ref-linux/</td>
<td></td>
</tr>
<tr>
<td>oss/X11/*</td>
<td>filesystem/targetfs/ from (all X11 libs and headers are present in appropriate locations)</td>
</tr>
<tr>
<td>oss/{ssl,usb}/</td>
<td>filesystem/targetfs/ (libs only in appropriate locations, headers deprecated)</td>
</tr>
</tbody>
</table>
API Changes in DRIVE OS 6.0

Overview

NVIDIA DRIVE OS 6.0 introduces API changes to the modules shown in the following figure:

**DRIVE PLATFORM APIs & SDKs**

**What’s New**

<table>
<thead>
<tr>
<th>Middleware &amp; Platform APIs</th>
<th>Workstation / Cloud (x86)</th>
<th>Embedded Target (Tegra)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linux</td>
<td>Linux</td>
</tr>
<tr>
<td></td>
<td>Standard</td>
<td>Safety Proxy¹</td>
</tr>
<tr>
<td>DriveWorks¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TensorRT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUDA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvStreams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvMedia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvMedia SIPL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvMedia DLA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulkan SC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulkan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cuDNN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OpenGL ES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGL Streams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OpenGL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1) Approximation of safety on non-safety platforms for development.
2) For development only, not for use in production.
3) Refer to the DRIVE OS Safety Manual and QNX Safety Manuals for safety context definitions.
4) Refer to DRIVE platform roadmap for scope of DriveWorks Safety Proxy and Safety Builds.

**Note:** Safety Proxy APIs are identical to Safety APIs on QNX and supported in the Standard build.
NVIDIA DRIVE OS 6.0 Migration Guide

NvMedia API Changes

Summary of the NvMedia API Timeline

Release 6.0.2.0
Both NvMedialmage and NvSciBuf APIs are available.

Release 6.0.3.0:
QNX Safety no longer uses NvMedialmage APIs. QNX Standard and Linux use NvMedialmage APIs.

Release 6.0.4.0:
NvMedialmage-based APIs are deprecated.

Note:
For releases with both NvMedialmage and NvSciBuf APIs, the NvSciBuf based APIs and test applications are packaged in the nvidia_6x directories.
When using NvSciBuf APIs, include the nvmmedia_6x directory first followed by the default include directories
Table 12. Support Matrix for NvMedia Multimedia APIs

<table>
<thead>
<tr>
<th>Release</th>
<th>Feature</th>
<th>6.0.0.0</th>
<th>6.0.1.0</th>
<th>6.0.2.0</th>
<th>6.0.3.0</th>
<th>6.0.4.0</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaImage based NvMediaImage Decoder [nvmedia_imgdec.h]</td>
<td>Decode via NvDEC</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Table 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td>Deprecate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvMedia Video Decode API [nvmedia_viddec.h]</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td></td>
</tr>
<tr>
<td>NvSciBuf based NvMediaDecode r API [nvmedia иде.h]</td>
<td></td>
<td>Supported</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvMedia Video Encode API [nvmedia_vep.h]</td>
<td>Encode via NvENC</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Table 14</td>
</tr>
<tr>
<td>NvMediaImage based NvMediaEP API [nvmedia_iep.h, nvmedia_iep_nvscis ync.h]</td>
<td></td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td></td>
<td>Deprecate</td>
<td></td>
</tr>
<tr>
<td>NvSciBuf based NvMediaEP API [nvmedia_iep.h]</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td></td>
</tr>
<tr>
<td>NvMediaImage based NvMediaIOFST API [nvmedia_iofst.h]</td>
<td>Optical Flow/ Stereo via OFA</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Deprecate</td>
<td>Table 15 Table 16</td>
</tr>
<tr>
<td>NvMediaImage based NvMediaOFA API [nvmedia_ofa.h]</td>
<td></td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvSciBuf based NvMediaOFA API [nvmedia_ofa.h]</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td></td>
</tr>
</tbody>
</table>

---

1 NvSciBuf-based APIs are introduced in DRIVE OS 6.0.2.0 separately from the NvMediaImage-based APIs

---

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<table>
<thead>
<tr>
<th>NvMedialmage based NvMedialJPD API (nvmedia_jpd.h)</th>
<th>JPEG Decode via NvJPEG</th>
<th>Supported</th>
<th>Supported</th>
<th>Supported</th>
<th>Supported</th>
<th>Deprecated</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvSciBuf based NvMedialJPD API (nvmedia_jpd.h)</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>Supported</td>
<td>Supported</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NvMedialmage base NvMedialJPEG API (nvmedia_jpe.h)</th>
<th>JPEG Encode via NvJPEG</th>
<th>Supported</th>
<th>Supported</th>
<th>Supported</th>
<th>Supported</th>
<th>Deprecated</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvSciBuf based NvMedialJPEG API (nvmedia_jpe.h)</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>Supported</td>
<td>Supported</td>
<td></td>
</tr>
</tbody>
</table>
### Table 13. NvMedia Video Decoder

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header File:</strong> nvmedia_videc.h</td>
<td>NvMedia Video Decoder APIs use the NVDEC HW engine on DRIVE OS 5.2 to decode bitstreams compressed using standard video compression algorithms such as H.264, H.265, VP9, VP8, and MPEG2. These APIs will be deprecated in DRIVE OS 6.0.4.0 release. NvSciBuf based NvMedia Decoder API will be introduced as a part of the DRIVE OS 6.0.2.0 release which will supersede the existing NvMedia Video Decoder APIs</td>
</tr>
<tr>
<td><strong>OLD NAME:</strong> NvMediaVideoDecoder *</td>
<td></td>
</tr>
<tr>
<td><strong>OLD API:</strong> NvMediaVideoDecoder *</td>
<td></td>
</tr>
<tr>
<td>NvMediaVideoDecoderCreateEx( const NvMediaDevice *device, NvMediaVideoCodec codec, uint16_t width, uint16_t height, uint16_t maxReferences, uint64_t maxBitstreamSize, uint8_t inputBuffering, uint32_t flags, NvMediaDecoderInstanceId instanceId )</td>
<td></td>
</tr>
</tbody>
</table>

- NvMediaDevice will be deprecated and the argument will be removed from the API
- Additionally the API name has changed
- NvMediaVideoCodec will be updated to support AV1 decoding only from T234 and further chips

| **Header File:** nvmedia_ide.h | |
| **New API:** NvMediaIDE * | |
| NvMediaIDECreate( NvMediaVideoCodec codec, uint16_t width, uint16_t height, uint16_t maxReferences, uint64_t maxBitstreamSize, | |
| Module: NvMedia Video Decoder | uint8_t inputBuffering,  
| | uint32_t flags,  
| | NvMediaDecoderInstanceId  
| | instanceId  
| | );  
| OLD API: | • NvMediaImage will be deprecated and replaced by NvSciBufObj  
| | Additionally, the API name might change  
| |  
| | Header File:  
| | nvmedia_ide.h  
| |  
| | New API:  
| | NvMediaStatus  
| | NvMediaIDEDecoderRender(  
| | const NvMediaIDE *decoder,  
| | NvSciBufObj target,  
| | const NvMediaPictureInfo *pictureInfo,  
| | const void *encryptParams,  
| | uint32_t numBitstreamBuffers,  
| | const NvMediaBitstreamBuffer *bitstreams,  
| | NvMediaIDEFrameStats *FrameStatsDump,  
| | NvMediaDecoderInstanceId instanceId  
| | );  
| OLD API: | N/A  
| | NvMediaIDEFillNvSciBufAttrList is a new API introduced in DRIVE OS 6.0 to fill IDE-specific attributes in the NvSciBufAttrList. The NvSciBufAttrList is used during creation of NvSciBufObj. This is a mandatory API  
| |  
| |
### Module: NvMedia Video Decoder

**Header File:**
```
nvmedia_ide.h
```

**NEW API:**
```
NvMediaStatus
NvMediaIDEFillNvSciBufAttrList(
    NvMediaDecoderInstanceId
    instanceId,
    NvSciBufAttrList
    attrlist
);```

**OLD API:**
```
NvMediaIDEFillNvSciSyncAttrList is a new API introduced in DRIVE OS 6.0 to fill IDE-specific Sync attributes in the NvSciBufAttrList. like engIndID. This is a mandatory API
```

**Header File:**
```
nvmedia_ide.h
```

**NEW API:**
```
NvMediaStatus
NvMediaIDEFillNvSciSyncAttrList(
    const NvMediaIDE
    *decoder,
    NvSciSyncAttrList
    attrlist,
    NvMediaNvSciSyncClientType
    clienttype
); ```
## Module: NvMedia Video Decoder

<table>
<thead>
<tr>
<th>OLD API:</th>
<th>In 5.2 these APIs are optional. In DRIVE OS 6.0 these APIs are mandatory if IDE needs to be used in a pipeline with other engine APIs. In DRIVE OS 6.0.2.0 these APIs will be supported for fence synchronization between Driver and Hardware.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header File:</td>
<td>nvmedia_ide.h</td>
</tr>
</tbody>
</table>
| NEW API:      | # NvMediaIDENvSciSync APIs  
NvMediaIDEFillNvSciSyncAttrList  
NvMediaIDERegisterNvSciSyncObj  
NvMediaIDEUnregisterNvSciSyncObj  
NvMediaIDESetNvSciSyncObjforEOF  
NvMediaIDEInsertPreNvSciSyncFence  
NvMediaIDEGetEOFNvSciSyncFence |

### Table 14. NvMedia IEP - NvMediaImage based to NvSciBuf based

<table>
<thead>
<tr>
<th>Module: NvMedia IEP</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header File and API</td>
<td>The existing NvMediaImage-based NvMediaIEP APIs are supported until the DRIVE OS 6.0.4.0 release and will be superseded by the NvSciBuf based NvMediaIEP APIs. The NvSciBuf based APIs will be introduced in the DRIVE OS 6.0.2.0 release. The changes between the existing NvMediaImage-based -APIs and the proposed NvSciBuf-based NvMediaIEP APIs are explained in the following rows.</td>
</tr>
</tbody>
</table>
| Header File:        | nvmedia_iep.h  
nvmedia_iep_nvscisync.h                                                                 |
<p>| API:                | NvMediaIEP*                                                                 |</p>
<table>
<thead>
<tr>
<th>Module: NvMedia IEP</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header File and API</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_iep.h</td>
<td></td>
</tr>
<tr>
<td><strong>NvMediaImage based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaIEP *</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPCreate(</td>
<td></td>
</tr>
<tr>
<td>const NvMediaDevice *device,</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPType encodeType,</td>
<td></td>
</tr>
<tr>
<td>const void *initParams,</td>
<td></td>
</tr>
<tr>
<td>NvMediaSurfaceType inputFormat,</td>
<td></td>
</tr>
<tr>
<td>uint8_t maxInputBuffering,</td>
<td></td>
</tr>
<tr>
<td>NvMediaEncoderInstanceId instanceId</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*NvMediaDevice will be deprecated and the argument will be removed from the API</td>
</tr>
<tr>
<td></td>
<td>*NvMediaSurfaceType will be replaced by NvSciBufAttrList, which will describe the properties of the surface in terms of NvSciBuf Attributes</td>
</tr>
<tr>
<td></td>
<td>*NvMediaIEPType will be updated to support AV1 encoding</td>
</tr>
<tr>
<td></td>
<td>maxInputBuffering will be deprecated and the argument will be removed from the API</td>
</tr>
<tr>
<td><strong>NvSciBuf based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvSciBuf based API:</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEP *</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPCreate(</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPType encodeType,</td>
<td></td>
</tr>
<tr>
<td>const void *initParams,</td>
<td></td>
</tr>
<tr>
<td>NvSciBufAttrList bufAttrList,</td>
<td></td>
</tr>
<tr>
<td>uint8_t maxBuffering,</td>
<td></td>
</tr>
<tr>
<td>NvMediaEncoderInstanceId instanceId</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*NvMediaImage will be deprecated and replaced by NvSciBufObj</td>
</tr>
<tr>
<td></td>
<td>*NvMediaRect will no longer be supported, and the argument will be removed from the API</td>
</tr>
<tr>
<td><strong>Header File</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_iep.h</td>
<td></td>
</tr>
<tr>
<td><strong>NvMediaImage based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaStatus</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPFeedFrame(</td>
<td></td>
</tr>
<tr>
<td>const NvMediaIEP *encoder,</td>
<td></td>
</tr>
<tr>
<td>const NvMediaImage *frame,</td>
<td></td>
</tr>
<tr>
<td>NvMediaRect *sourceRect,</td>
<td></td>
</tr>
<tr>
<td>const void *picParams,</td>
<td></td>
</tr>
<tr>
<td>NvMediaEncoderInstanceId instanceId</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*NvSciBufObj replaces NvMediaImage, which is deprecated with 6.0</td>
</tr>
<tr>
<td></td>
<td>accessMode is deprecated and removed</td>
</tr>
<tr>
<td><strong>Header File</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_iep.h</td>
<td></td>
</tr>
<tr>
<td><strong>NvMediaImage based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaStatus</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPFeedFrame(</td>
<td></td>
</tr>
<tr>
<td>const NvMediaIEP *encoder,</td>
<td></td>
</tr>
<tr>
<td>NvSciBufObj bufObj,</td>
<td></td>
</tr>
<tr>
<td>const void *picParams,</td>
<td></td>
</tr>
<tr>
<td>NvMediaEncoderInstanceId instanceId</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
</tbody>
</table>
### Module: NvMedia IEP

#### Header File and API

<table>
<thead>
<tr>
<th>NvMediaImage based API:</th>
<th>NvSciBuf based API:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NvMediaIEPImageRegister</strong></td>
<td><strong>NvMediaIEPImageRegisterNvSciBufObj</strong></td>
</tr>
<tr>
<td><code>NvMediaStatus NvMediaIEPImageRegister(</code></td>
<td><code>NvMediaStatus NvMediaIEPImageRegisterNvSciBufObj(</code></td>
</tr>
<tr>
<td>const NvMediaIEP *encoder,</td>
<td>const NvMediaIEP *encoder,</td>
</tr>
<tr>
<td>const NvMediaImage *image,</td>
<td>NvSciBufObj bufObj</td>
</tr>
<tr>
<td>NvMediaAccessMode accessMode</td>
<td></td>
</tr>
<tr>
<td><code>);</code></td>
<td><code>);</code></td>
</tr>
</tbody>
</table>

**Header File:**

nvmedia_iep.h

**Comments:**

NvSciBufObj replaces NvMediaImage, which is deprecated with 6.0

<table>
<thead>
<tr>
<th>NvMediaImage based API:</th>
<th>NvSciBuf based API:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NvMediaIEPImageUnRegister</strong></td>
<td><strong>NvMediaIEPUnregisterNvSciBufObj</strong></td>
</tr>
<tr>
<td><code>NvMediaStatus NvMediaIEPImageUnRegister(</code></td>
<td><code>NvMediaStatus NvMediaIEPUnregisterNvSciBufObj(</code></td>
</tr>
<tr>
<td>const NvMediaIEP *encoder,</td>
<td>const NvMediaIEP *encoder,</td>
</tr>
<tr>
<td>const NvMediaImage *image</td>
<td>NvSciBufObj bufObj</td>
</tr>
<tr>
<td><code>);</code></td>
<td><code>);</code></td>
</tr>
</tbody>
</table>

**Header File:**

nvmedia_iep.h

**Comments:**

API renamed to NvMediaIEPGetBits

<table>
<thead>
<tr>
<th>NvMediaImage based API:</th>
<th>NvSciBuf based API:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NvMediaIEPGetBitsEx</strong></td>
<td><strong>NvMediaIEPFillNvSciBufAttrList</strong></td>
</tr>
<tr>
<td><code>NvMediaStatus NvMediaIEPGetBitsEx(</code></td>
<td><code>NvMediaStatus NvMediaIEPFillNvSciBufAttrList</code></td>
</tr>
<tr>
<td>const NvMediaIEP *encoder,</td>
<td></td>
</tr>
<tr>
<td>uint32_t *numBytes,</td>
<td></td>
</tr>
<tr>
<td>uint32_t numBitstreamBuffers,</td>
<td></td>
</tr>
<tr>
<td>const NvMediaBitstreamBuffer *bitstreams,</td>
<td></td>
</tr>
<tr>
<td>void *extradata</td>
<td></td>
</tr>
<tr>
<td><code>);</code></td>
<td><code>);</code></td>
</tr>
</tbody>
</table>

**Header File:**

N/A

**Comments:**

NvMediaIEPGetBitsEx is a new API introduced in DRIVE OS 6.0 to fill IEP-specific attributes in the NvSciBufAttrList. The NvSciBufAttrList is used during creation of NvSciBufObj. This is a mandatory API, which
### Module: NvMedia IEP

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaStatus</td>
<td>needs to be called to populate NvSciBufAttrList that would eventually get used during NvSciBufObj allocation.</td>
</tr>
<tr>
<td>NvMediaIEPFillNvSciBufAttrList(</td>
<td></td>
</tr>
<tr>
<td>NvMediaEncoderInstanceId</td>
<td></td>
</tr>
<tr>
<td>NvSciBufAttrList attrlist</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_iep_nvscisync.h</td>
<td></td>
</tr>
<tr>
<td><strong>NvMediaImage based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPNvSciSyncGetVersion</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPFillNvSciSyncAttrList</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPRegisterNvSciSyncObj</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPUnregisterNvSciSyncObj</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPSetNvSciSyncObjforEOF</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPInsertPreNvSciSyncFence</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPGetEOFNvSciSyncFence</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPSetNvSciSyncObjforSOF</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPGetSOFNvSciSyncFence</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_iep_nvscisync.h</td>
<td></td>
</tr>
<tr>
<td><strong>NvMediaImage based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPSetNvSciSyncObjforSOF</td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPGetSOFNvSciSyncFence</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_iep_nvscisync.h</td>
<td></td>
</tr>
<tr>
<td><strong>NvMediaImage based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaIEPNvSciSyncGetVersion</td>
<td></td>
</tr>
<tr>
<td>NvMediaStatus</td>
<td>This API will be deprecated in DRIVE OS 6.0.4.0 release</td>
</tr>
<tr>
<td>NvMediaIEPNvSciSyncGetVersion(</td>
<td></td>
</tr>
<tr>
<td>NvMediaVersion *version</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
</tbody>
</table>

In 5.2 these APIs are optional. In DRIVE OS 6.0 these APIs are mandatory if IEP needs to be used in a pipeline with other engine APIs.

In DRIVE OS 5.2 these APIs were not supported, but they will be supported in 6.0.

The contents of `nvmedia_iep_nvscisync.h` header file will be merged with `nvmedia_iep.h` and the resulting API set will have a single version.
### Module: NvMedia IEP

**Header File and API**

<table>
<thead>
<tr>
<th>Header File:</th>
</tr>
</thead>
<tbody>
<tr>
<td>nvmedia_common_encode.h</td>
</tr>
<tr>
<td>nvmedia_common_encode_decode.h</td>
</tr>
<tr>
<td>nvmedia_common_encode_ofst.h</td>
</tr>
</tbody>
</table>

**Comments**

The data structures fields will be reorganized and cleaned up, removing unsupported fields previously retained for backward compatibility and making a cohesive grouping of features to enhance ease of use.

---

### Table 15. NvMedia IOFST (DRIVE OS 5.2) to NvMedia IOFA

<table>
<thead>
<tr>
<th>Module: NvMedia IOFST</th>
</tr>
</thead>
</table>

**Header File and API**

<table>
<thead>
<tr>
<th>Header File:</th>
</tr>
</thead>
<tbody>
<tr>
<td>nvmedia_iofst.h</td>
</tr>
<tr>
<td>nvmedia_iofst_nvscisync.h</td>
</tr>
</tbody>
</table>

**API:**

NvMediaIOFST*

**Comments**

NvMedia IOFST APIs use the NVENC HW engine on Xavier DRIVE OS 5.2 to perform Optical Flow and Stereo Disparity Processing Tasks. In Orin DRIVE OS 6.0, the NVENC HW engine no longer supports Optical Flow and Stereo Disparity Processing, and these APIs will be deprecated in DRIVE OS 6.0.

With Orin we introduce a new engine OFA for Optical Flow and Stereo Disparity Processing. The NvMedia IOFA APIs support computation of Optical Flow and Stereo Disparity using the OFA engine. Users of NvMedia IOFST APIs should transition to the NvMedia IOFA APIs newly defined in DRIVE OS 6.0. The look, feel and, usage of the new NvMedia IOFA APIs are similar to prior NvMedia IOFA APIs.

---

<table>
<thead>
<tr>
<th><strong>Header File:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>nvmedia_iofst.h</td>
</tr>
</tbody>
</table>

**API:**

NvMediaIOFSTGetVersion( NvMediaVersion *version );

---

<table>
<thead>
<tr>
<th><strong>Header File:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>nvmedia_iofst.h</td>
</tr>
</tbody>
</table>

**API:**

NvMediaIOFST * NvMediaIOFSTCreate();

---

<table>
<thead>
<tr>
<th><strong>Header File:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>nvmedia_oa.h</td>
</tr>
</tbody>
</table>

**API:**

NvMediaStatus NvMediaIOFAGetVersion( NvMediaVersion *version );

---

<table>
<thead>
<tr>
<th><strong>Header File:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>nvmedia_oa.h</td>
</tr>
</tbody>
</table>

**API:**

NvMediaOFA * NvMediaIOFACreate();
### Module: NvMedia IOFST

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>const NvMediaDevice *device, NvMediaIOFSTType estimationType, NvMediaSurfaceType inputFormat, NvMediaSurfaceType outputFormat, const NvMediaOFSTInitializeParams *initParams, uint8_t maxInputBuffering, NvMediaEncoderInstanceId instanceId );</td>
<td>void NvMediaIOFSTDestroy(const NvMediaIOFST *ofst);</td>
</tr>
</tbody>
</table>

Followed by:

NvMediaStatus
NvMediaIOFAInit (const NvMediaDevice *device, NvMediaOfa *ofaPubl, const NvMediaOfaInitParams *initParams, const uint8_t maxInputBuffering );

Some of the existing arguments, such as estimationType, inputFormat, and outputFormat, are members of the NvMediaOfaInitParams structure, along with additional new parameters.

<table>
<thead>
<tr>
<th>Header File: nvmedia_iofst.h</th>
<th>API: void NvMediaIOFSTDestroy(const NvMediaIOFST *ofst);</th>
</tr>
</thead>
</table>

API:

NvMediaStatus
NvMediaIOFSTProcessFrame (const NvMediaIOFST *ofst, const NvMediaImage *frame, const NvMediaImage *refFrame, const NvMediaImage *mvs,

| Header File: nvmedia_iofst.h | API: NvMediaStatus
NvMediaIOFSTProcessFrame (const NvMediaIOFST *ofst, const NvMediaImage *frame, const NvMediaImage *refFrame, const NvMediaImage *mvs,

| Header File: nvmedia_ofa.h | API: NvMediaStatus
NvMediaIOFAInit (const NvMediaDevice *device, NvMediaOfa *ofaPubl, const NvMediaOfaInitParams *initParams, const uint8_t maxInputBuffering );

| Header File: nvmedia_ofa.h | API: NvMediaStatus
NvMediaIOFAProcessFrame (const NvMediaOfa *ofaPubl, const NvMediaOfaImageArray *pSurfArray,
### Module: NvMedia IOFST

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>const NvMediaOFSTExternalHintParams *extHintParams, NvMediaEncoderInstanceId instanceId</td>
<td>const NvMediaOfaProcessParams *processParams, const NvMediaOfaROIParams *pROIParams); Some of the existing arguments, like frame, refFrame, mvs, or analogs of these parameters, are members of the NvMediaOfaImageArray structure along with additional new parameters. The frame, reframe and mvs are the image pyramids in case of OFA. Please refer to API documentation for more information.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Header File: nvmedia_iostf.h</th>
<th>Header File: nvmedia_ofa.h</th>
</tr>
</thead>
<tbody>
<tr>
<td>API: NvMediaStatus NvMediaIOFSTImageRegister( const NvMediaIOFST *ofst, const NvMediaImage *image, NvMediaAccessMode accessMode );</td>
<td>API: NvMediaIOFAImageRegister ( const NvMediaOfa *ofaPubl, const NvMediaImage *image, const NvMediaAccessMode accessMode );</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Header File: nvmedia_iostf.h</th>
<th>Header File: nvmedia_ofa.h</th>
</tr>
</thead>
<tbody>
<tr>
<td>API: NvMediaStatus NvMediaIOFSTImageUnRegister( const NvMediaIOFST *ofst, const NvMediaImage *image );</td>
<td>API: NvMediaIOFAImageUnRegister ( const NvMediaOfa *ofaPubl, const NvMediaImage *image );</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Header File: nvmedia_iostf.h</th>
<th>Header File: nvmedia_ofa.h</th>
</tr>
</thead>
<tbody>
<tr>
<td>API: N/A</td>
<td>API: (Get SGM configuration in use.) NvMediaStatus NvMediaIOFAGetSGMConfigParams (</td>
</tr>
<tr>
<td>Module: NvMedia IOFST</td>
<td>Comments</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Header File and API</strong></td>
<td><strong>Comments</strong></td>
</tr>
<tr>
<td>const NvMediaOfa *ofaPubl, NvMediaOfaSGMParams *pSGMParams;</td>
<td>[Set SGM configuration] NvMediaStatus NvMediaIOFASetSGMConfigParams ( const NvMediaOfa *ofaPubl, NvMediaOfaSGMParams *pSGMParams ); Usage: <strong>OPTIONAL</strong></td>
</tr>
</tbody>
</table>

**Header File:** nvmedia_iofst.h

**API:**
N/A

**Header File:** nvmedia_ofa.h

**API:**
N/A

| **Usage:** **OPTIONAL** |

**Header File:** nvmedia_iofst.h

**API:**
N/A

**Header File:** nvmedia_ofa.h

**API:**
N/A

**Usage:** **OPTIONAL**
<table>
<thead>
<tr>
<th>Module: NvMedia IOFA</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header File:</strong> nvmedia_ofa.h</td>
<td><strong>Header File:</strong> nvmedia_iofa.h</td>
</tr>
<tr>
<td><strong>NvMedia Image based API:</strong> NvMediaStatus NvMediaIOFAInit (</td>
<td>NvMediaDevice is deprecated and the argument is removed from the API</td>
</tr>
<tr>
<td>*device, NvMediaOfa *ofaPubl, *initParams, const uint8_t maxInputBuffering</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong> nvmedia_ofa.h</td>
<td><strong>Header File:</strong> nvmedia_iofa.h</td>
</tr>
<tr>
<td><strong>NvMedia Image based API:</strong> NvMediaStatus NvMediaIOFAProcessFrame (</td>
<td>NvMediaOfaImageArray is replaced by NvMediaIOFABufArray which uses NvSciBufObj instead of NvMediaImage.</td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong> nvmedia_ofa.h</td>
<td><strong>Header File:</strong> nvmedia_iofa.h</td>
</tr>
<tr>
<td><strong>NvSciBuf based API:</strong> NvMediaStatus NvMediaIOFAInit (</td>
<td></td>
</tr>
<tr>
<td>*ofaPubl, *initParams, const uint8_t maxInputBuffering</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong> nvmedia_ofa.h</td>
<td><strong>Header File:</strong> nvmedia_iofa.h</td>
</tr>
<tr>
<td><strong>NvSciBuf based API:</strong> NvMediaStatus NvMediaIOFAProcessFrame (</td>
<td></td>
</tr>
<tr>
<td>);</td>
<td></td>
</tr>
</tbody>
</table>
### Module: NvMedia IOFA

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
</table>
| **NvMediaImage based API:**<br>NvMediaIOFAImageRegister (const NvMediaOfa *ofaPubl, const NvMediaImage *image, const NvMediaAccessMode accessMode); | **NvSciBuf based API:**<br>NvMediaIOFARegisterNvSciBufObj (const NvMediaOfa *ofaPubl, NvSciBufObj bufObj);
- NvSciBufObj replaces NvMediaImage
- NvMediaAccessMode will be removed and is passed as NvSciBufObj attribute list. |

**Header File:** nvmedia_ofa.h

**NvMediaImage based API:**<br>NvMediaIOFAImageUnRegister (const NvMediaOfa *ofaPubl, const NvMediaImage *image);  

**Header File:** nvmedia_iosta_nvscisync.h

**API:**
- NvMediaIOFSTFillNvSciSyncAttrList
- NvMediaIOFSTRegisterNvSciSyncObj
- NvMediaIOFSTUnregisterNvSciSyncObj
- NvMediaIOFSTSetNvSciSyncObjforEOF
- NvMediaIOFSTInsertPreNvSciSyncFence
- NvMediaIOFSTGetEOTFfNvSciSyncFence
- NvMediaIOFSTSetNvSciSyncObjforSOF
- NvMediaIOFSTGetSOFNvSciSyncFence

**In DRIVE OS 5.2 the NvSciSync APIs for IOFA were optional. The newly defined analogues of these APIs for IOFA are mandatory in 6.0 if IOFA needs to be used in a pipeline with other engine APIs.**

**Header File:** nvmedia_iosta.h

- NvMediaIOFAFillNvSciSyncAttrList
- NvMediaIOFARegisterNvSciSyncObj
- NvMediaIOFAUnregisterNvSciSyncObj
- NvMediaIOFASetNvSciSyncObjforEOF
- NvMediaIOFAInsertPreNvSciSyncFence
- NvMediaIOFAGetEOTFfNvSciSyncFence
- NvMediaIOFASetNvSciSyncObjforSOF
- NvMediaIOFAGetSOFNvSciSyncFence

**Header File:** nvmedia_iosta_nvscisync.h

- NvMediaIOFAFillNvSciBufAttrList is a new API in DRIVE OS 6.0 to fill IOFA specific attributes in the NvSciBufAttrList. The

---

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NVIDIA DRIVE OS 5.1 to 6.0 SDK Migration Guide
### Module: NvMedia IOFA

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>API:</strong></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>NvSciBufAttrList is used during creation of NvSciBufObj. This API is mandatory</td>
<td></td>
</tr>
<tr>
<td>NvMediaStatus</td>
<td></td>
</tr>
<tr>
<td>NvMediaIOFAFillNvSciBufAttrList(NvSciBufAttrList attrlist)</td>
<td></td>
</tr>
</tbody>
</table>

### Module: NvMedia IJPEG Decode

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header File:</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_ijpd.h</td>
<td></td>
</tr>
<tr>
<td><strong>NvMediaImage based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaIJPD * NvMediaIJPDCreate(</td>
<td></td>
</tr>
<tr>
<td>const NvMediaDevice *device, uint16_t maxWidth, uint16_t maxHeight, uint32_t maxBitstreamBytes, uint8_t supportPartialAccel, NvMediaJPEGInstanceId instanceId</td>
<td></td>
</tr>
<tr>
<td>)</td>
<td></td>
</tr>
<tr>
<td>• NvMediaDevice is deprecated and the argument is removed from the API</td>
<td></td>
</tr>
<tr>
<td>• NvMediaJPEGInstanceId parameter is added with Orin. DRIVE OS 6.0 supports two instances of NVJPEG hardware</td>
<td></td>
</tr>
<tr>
<td><strong>NvSciBuf based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaIJPD * NvMediaIJPDCreate(</td>
<td></td>
</tr>
<tr>
<td>uint16_t maxWidth, uint16_t maxHeight, uint32_t maxBitstreamBytes, bool supportPartialAccel, NvMediaJPEGInstanceId instanceId</td>
<td></td>
</tr>
<tr>
<td>)</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_ijpd.h</td>
<td></td>
</tr>
<tr>
<td><strong>NvMediaImage based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaStatus NvMediaIJPDRender(</td>
<td></td>
</tr>
<tr>
<td>const NvMediaIJPD *decoder, NvMediaImage *output, const NvMediaRect *srcRect,</td>
<td></td>
</tr>
<tr>
<td>)</td>
<td></td>
</tr>
<tr>
<td>• NvMediaImage is deprecated and replaced by NvSciBufObj</td>
<td></td>
</tr>
<tr>
<td>• NvMediaJPEGInstanceId parameter is added with Orin. DRIVE OS 6.0 supports two instances of NVJPEG hardware</td>
<td></td>
</tr>
<tr>
<td><strong>NvSciBuf based API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaStatus NvMediaIJPDRender(</td>
<td></td>
</tr>
<tr>
<td>)</td>
<td></td>
</tr>
</tbody>
</table>
### Module: NvMedia JPEG Decode

**Header File and API**

```c
const NvMediaRect *dstRect,
uint8_t downscaleLog2,
uint32_t numBitstreamBuffers,
const NvMediaBitstreamBuffer *bitstreams,
uint32_t flags,
NvMediaJPEGInstanceId instanceId
);
```

**Comments**

```c
const NvMediaIJPD *decoder,
NvSciBufObj target,
const NvMediaRect *srcRect,
const NvMediaRect *dstRect,
uint8_t downscaleLog2,
uint32_t numBitstreamBuffers,
const NvMediaBitstreamBuffer *bitstreams,
uint32_t flags,
NvMediaJPEGInstanceId instanceId
);
```

- NvMediaImage is deprecated and replaced by NvSciBufObj.
- NvMediaJPEGInstanceId parameter is added with Orin. DRIVE OS 6.0 supports two instances of NVJPEG hardware.

**NvMediaImage based API:**

```c
NvMediaStatus
NvMediaIJPDRenderYUV(
    const NvMediaIJPD *decoder,
    NvMediaImage *output,
    uint8_t downscaleLog2,
    uint32_t numBitstreamBuffers,
    const NvMediaBitstreamBuffer *bitstreams,
    uint32_t flags,
    NvMediaJPEGInstanceId instanceId
);
```

**NvSciBuf based API:**

```c
NvMediaStatus
NvMediaIJPDRenderYUV(
    const NvMediaIJPD *decoder,
    NvSciBufObj target,
    uint8_t downscaleLog2,
    uint32_t numBitstreamBuffers,
    const NvMediaBitstreamBuffer *bitstreams,
    uint32_t flags,
    NvMediaJPEGInstanceId instanceId
);
```

---

**Header File:**

- `nvmedia_ijpd.h`
- `nvmedia_ijpd_nvscisync.h`

**API:**

- NvMediaIJPDFillNvSciBufAttrs
- NvMediaIJPDNVsCsSyncGetVersion
- NvMediaIJPDFillNvSciSyncAttrList
- NvMediaIJPDRegisterNvSciSyncObj
- NvMediaIJPDUnregisterNvSciSyncObj

DRIVE OS 6.0 introduces new APIs for synchronization that are analogous to 5.2 NvMedia IEP synchronization APIs. The 6.0 APIs are mandatory when the NvMedia JPEG Decoder is used in a pipeline scenario.
### Module: NvMedia IJPEG Decode

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaIJPDSetNvSciSyncObjforEOF</td>
<td></td>
</tr>
<tr>
<td>NvMediaIJPDInsertPreNvSciSyncFence</td>
<td></td>
</tr>
<tr>
<td>NvMediaIJPDGetEOFNvSciSyncFence</td>
<td></td>
</tr>
<tr>
<td>NvMediaIJPDSetNvSciSyncObjforSOF</td>
<td></td>
</tr>
<tr>
<td>NvMediaIJPDGetSOFNvSciSyncFence</td>
<td></td>
</tr>
</tbody>
</table>

### Table 18. NvMedia IJPEG Encode

<table>
<thead>
<tr>
<th>Module: NvMedia IJPEG Encode</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Header File: nvmedia_ijpe.h   | • NvMediaDevice is deprecated in 6.0 and the argument is removed from the API  
| API:                          | • NvMediaJPEGInstanceId parameter is added with Orin. DRIVE OS 6.0 supports two instances of NVJPEG hardware  
| NvMediaIJPE *                 | • An analogous type replaces the NvMediaSurfaceType parameter  
| NvMediaIJPECreate(            | |
|     const NvMediaDevice *device, | |
|     NvMediaSurfaceType inputFormat, | |
|     uint8_t maxOutputBuffering, | |
|     uint32_t maxBitstreamBytes,  | |
|     NvMediaJPEGInstanceId instanceId | |
| );                            | |
| API:                          | |
| NvMediaStatus                 | |
| NvMediaIJPEFeedFrameQuant(     | |
|     const NvMediaIJPE *encoder, | |
|     NvMediaImage *frame,       | |
|     uint8_t *lumaQuant,        | |
|     uint8_t *chromaQuant,      | |
|     NvMediaJPEGInstanceId instanceId | |
| );                            | |

| Header File: nvmedia_ijpe.h   | |
| API:                          | • NvMediaImage is deprecated and replaced by NvSciBufObj  
| NvMediaIJPEFeedFrameQuant(     | • NvMediaJPEGInstanceId parameter is added with Orin. Drive OS 6.0 supports two instances of NVJPEG hardware  
|     const NvMediaIJPE *encoder, | |
|     NvMediaImage *frame,       | |
|     uint8_t *lumaQuant,        | |
|     uint8_t *chromaQuant,      | |
|     NvMediaJPEGInstanceId instanceId | |
| );                            | |
## Module: NvMedia JPEG Encode

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header File:</strong></td>
<td></td>
</tr>
<tr>
<td>nvmedia_ijpe.h</td>
<td></td>
</tr>
<tr>
<td><strong>API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMediaStatus</td>
<td></td>
</tr>
<tr>
<td>NvMediaIJPEFeedFrame(const NvMediaIJPE *encoder, NvMediaImage *frame, uint8_t quality, NvMediaJPEGInstanceId instanceId);</td>
<td>• NvMediaImage is deprecated and replaced by NvSciBufObj&lt;br&gt;• NvMediaJPEGInstanceId parameter is added with Orin. DRIVE OS 6.0 supports two instances of NVJPEG hardware</td>
</tr>
</tbody>
</table>

| **Header File:**    |          |
| nvmedia_ijpe.h      |          |
| **API:**            |          |
| NvMediaStatus       |          |
| NvMediaIJPEFeedFrameRateControl(const NvMediaIJPE *encoder, NvMediaImage *frame, uint8_t *lumaQuant, uint8_t *chromaQuant, uint32_t targetImageSize, NvMediaJPEGInstanceId instanceId); | • NvMediaImage is deprecated and replaced by NvSciBufObj<br>• NvMediaJPEGInstanceId parameter is added with Orin. DRIVE OS 6.0 supports two instances of NVJPEG hardware |

| **Header File:**    |          |
| nvmedia_ijpe_nvscisync.h |        |
| **API:**            |          |
| NvMediaIJPEFillNvSciBufAttrs NvMediaIJPEFillNvSciSyncGetSize NvMediaIJPEFillNvSciSyncAttrList NvMediaIJPERegisterNvSciSyncObj NvMediaIJPEUnregisterNvSciSyncObj NvMediaIJPESetNvSciSyncObjforEOF NvMediaIJPEInsertPreNvSciSyncFence NvMediaIJPEGetEOFNvSciSyncFence | DRIVE OS 6.0 introduces new APIs for synchronization that are analogous to 5.2 NvMedia IEP synchronization APIs. The 6.0 APIs are mandatory when the NvMedia JPEG Encoder is used in a pipeline scenario |
### Module: NvMedia JPEG Encode

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaIJPESetNvSciSyncObjforSOF</td>
<td></td>
</tr>
<tr>
<td>NvMediaIJPEGetSOFNvSciSyncFence</td>
<td></td>
</tr>
</tbody>
</table>

### Table 19. NvMedia VPI

<table>
<thead>
<tr>
<th>Module: NvMedia VPI</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header File:</td>
<td></td>
</tr>
<tr>
<td>nvmedia_vpi.h</td>
<td>In NVIDIA DRIVE OS 5.2, NvMedia VPIs use PVA engines to perform fixed</td>
</tr>
<tr>
<td>nvmedia_vpi_nvscisync.h</td>
<td>computer vision functions. In 6.0, NvMedia VPIs are removed. To use</td>
</tr>
<tr>
<td></td>
<td>the PVA engine, use DriveWorks or cuPVA</td>
</tr>
<tr>
<td>API:</td>
<td></td>
</tr>
<tr>
<td>NvMediaVPI*</td>
<td></td>
</tr>
</tbody>
</table>

### Module: NvMedia Image Pyramid

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header File:</td>
<td></td>
</tr>
<tr>
<td>nvmedia_image_pyramid.h</td>
<td></td>
</tr>
<tr>
<td>nvmedia_image_pyramid_nvscisync.h</td>
<td>NvMedia Image Pyramid, which is only used by NvMedia VPI, is removed in</td>
</tr>
<tr>
<td></td>
<td>DRIVE OS 6.0</td>
</tr>
<tr>
<td>API:</td>
<td></td>
</tr>
<tr>
<td>NvMediaVPI*</td>
<td></td>
</tr>
</tbody>
</table>

### Module: NvMedia Array

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header File:</td>
<td></td>
</tr>
<tr>
<td>nvmedia_array.h</td>
<td>NvMedia Array, which is only used by NvMedia VPI, is removed in DRIVE</td>
</tr>
<tr>
<td>nvmedia_array_nvscibuf.h</td>
<td>OS 6.0</td>
</tr>
<tr>
<td>API:</td>
<td></td>
</tr>
<tr>
<td>NvMediaArray*</td>
<td></td>
</tr>
<tr>
<td>Header File:</td>
<td></td>
</tr>
<tr>
<td>nvmedia_array.h</td>
<td></td>
</tr>
<tr>
<td>nvmedia_array_arraymetadata.h</td>
<td></td>
</tr>
<tr>
<td>nvmedia_array_nvscibuf.h</td>
<td></td>
</tr>
<tr>
<td>API:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 20. Camera/SIPL API Changes
Several APIs and structures were updated.

<table>
<thead>
<tr>
<th>File</th>
<th>Current API or Structure that will Change</th>
<th>Change Description and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvSIPLCamera.hpp</td>
<td>virtual SIPLStatus INvSIPLCamera::GetImageAttributes(</td>
<td>• NvSIPLImageAttr becomes a list of NvSciBuf Attribute name/value pairs.</td>
</tr>
<tr>
<td></td>
<td>uint32_t index,</td>
<td>• The API name may change</td>
</tr>
<tr>
<td></td>
<td>INvSIPLClient::ConsumerDesc::OutputType const outType,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NvSIPLImageAttr &amp;imageAttr) = 0;</td>
<td>Update to the new</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GetImageAttributes function call and use the new NvSciBuf attribute list instead of the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NvSIPLImageAttr list</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvSIPLCamera.hpp</td>
<td>virtual SIPLStatus INvSIPLCamera::RegisterImageGroups(</td>
<td>• NvMediaImageGroup will become NvSciBuf Objects.</td>
</tr>
<tr>
<td></td>
<td>uint32_t index,</td>
<td>• The API name may change</td>
</tr>
<tr>
<td></td>
<td>const</td>
<td>Update to the new</td>
</tr>
<tr>
<td></td>
<td>std::vector&lt;NvMediaImageGroup*&gt; &amp;imageGroups) = 0;</td>
<td>RegisterImageGroups function. Use of the NvMediaImageGroup vector will need to change to a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>vector of NvSciBuf objects</td>
</tr>
<tr>
<td>NvSIPLCamera.hpp</td>
<td>virtual SIPLStatus INvSIPLCamera::RegisterImages(</td>
<td>• NvMediaImage becomes NvSciBuf Object</td>
</tr>
<tr>
<td></td>
<td>uint32_t index,</td>
<td>• The API name may change</td>
</tr>
<tr>
<td></td>
<td>INvSIPLClient::ConsumerDesc::OutputType const outType,</td>
<td>Use the of NvMediaImage vector will need to change to a vector of Nv SciBuf objects</td>
</tr>
<tr>
<td></td>
<td>const</td>
<td></td>
</tr>
<tr>
<td></td>
<td>std::vector&lt;NvMediaImage*&gt; &amp;images) = 0;</td>
<td></td>
</tr>
<tr>
<td>NvSIPLCamera.hpp</td>
<td>virtual SIPLStatus INvSIPLCamera::FillNvSciSyncAttrList(</td>
<td>• NvMediaNvSciSyncClientType becomes NvSciSyncClientType.</td>
</tr>
<tr>
<td></td>
<td>uint32_t index,</td>
<td>• The API call is mandatory. Use of this API was optional; it will now be mandatory. In</td>
</tr>
<tr>
<td></td>
<td>INvSIPLClient::ConsumerDesc::OutputType const outType,</td>
<td>addition, you</td>
</tr>
<tr>
<td></td>
<td>)</td>
<td></td>
</tr>
<tr>
<td>File</td>
<td>Current API or Structure that will Change</td>
<td>Change Description and Notes</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------</td>
<td>-------------------------------</td>
</tr>
</tbody>
</table>
| NvSIPLPipelineMgr.hpp | virtual SIPLStatus INvSIPLCamera::RegisterNvSciSyncObj( uint32_t index, INvSIPLClient::ConsumerDesc::OutputType const outType, NvMediaNvSciSyncObjType const syncobjtype, NvSciSyncObj const syncobj) = 0; | • NvMediaNvSciSyncObjType becomes NvSciSyncObjType Objects  
• The API call is mandatory. Use of this API was optional; it will now become mandatory. In addition, you will need to use NvSciSyncObjType instead of NvMediaNvSciSyncClientType |
| NvSIPLPipelineMgr.hpp | NvSIPLImageGroupWriter::RawBuffer::NvMediaImageGroup *imageGroup; | NvMediaImageGroup becomes NvSciBuf Objects  
Provide a pointer to an NvSciBuf object instead of an object to a NvMediaImageGroup |
| NvSIPLPipelineMgr.hpp | NvSIPLImageAttr | The structure will be removed. Stop using it and migrate to the newly provided NvSciBuf attribute pairs |
| NvSIPLPipelineMgr.hpp | NvSIPLDownscaleCropCfg::NvMediaRect ispInputCrop;  
NvSIPLDownscaleCropCfg::NvMediaRect isp0OutputCrop;  
NvSIPLDownscaleCropCfg::NvMediaRect isp1OutputCrop; | A new SIPL type replaces NvMediaRect  
Migrate to the newly provided structure. The new structure will have equivalent members to NvMediaRect. The change is only in the naming convention |
| NvSIPLClient.hpp | INvSIPLClient::INvSIPLClient::ImageMetaData::NvMediaISPBadPixelStatsData badPixelStats  
INvSIPLClient::INvSIPLClient::ImageMetaData::NvMediaTimeBase timeBase;  
INvSIPLClient::INvSIPLClient::ImageMetaData::NvMediaGlob | Equivalent functionality defined by SIPL replaces NvMediaISPXXX  
Migrate to newly the provided structures. The new structures will have equivalent members to NvMediaISPxxx structures. The change is only in the naming convention |
<table>
<thead>
<tr>
<th>File</th>
<th>Current API or Structure that will Change</th>
<th>Change Description and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>alTime</td>
<td>captureGlobalTimeStamp;</td>
<td></td>
</tr>
<tr>
<td>INvSIPLClient::INvSIPLClient::ImageMetaData::NvMediaISPHistogramStatsData histogramStats[2];</td>
<td>Equivalent functionality defined by SIPL replaces NvMediaISPXXX. Migrate to newly provided structures. The new structures will have equivalent members to NvMediaISPxxx structures. The change is only in the naming convention</td>
<td></td>
</tr>
<tr>
<td>INvSIPLClient::INvSIPLClient::ImageMetaData::NvMediaISPHistogramSettings histogramSettings[2];</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INvSIPLClient::INvSIPLClient::ImageMetaData::NvMediaISPLocalAvgClipStatsData localAvgClipStats[2];</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INvSIPLClient::INvSIPLClient::ImageMetaData::NvMediaISPLocalAvgClipStats localAvgClipSettings[2];</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvSiplControlAutoDef.hpp</td>
<td>SiplControlIspStatsSetting::NvMediaISPLocalAvgClipStats lac[2];</td>
<td></td>
</tr>
<tr>
<td>SiplControlIspStatsSetting::NvMediaISPHistogramStats hist1;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SiplControlIspStatsSetting::NvMediaISPFlickerBandStats fbStats;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NvSIPLDeviceBlockInfo.hpp</td>
<td>SensorInfo::VirtualChannelInfo::NvMediaICPInputFormatType inputFormat</td>
<td>Equivalent functionality defined by SIPL replaces NvMediaICPInputFormatType. Migrate to the newly provided enumeration. The new enumeration will have equivalent values to NvMediaICPInputFormatType enumeration. You will also need</td>
</tr>
<tr>
<td>File</td>
<td>Current API or Structure that will Change</td>
<td>Change Description and Notes</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CNvMDeviceBlockInfo.hpp</td>
<td>DeviceBlockInfo::NvMediaICPInterfaceType csiPort</td>
<td>Equivalent functionality defined by SIPL replaces NvMediaICPInterfaceType and NvMediaICPCsiPhyMode. Migrate to the newly provided enumeration. The new enumerations will have equivalent values to NvMediaICPInterfaceType, NvMediaICPCsiPhyMode enumerations. You will also need to update the naming of individual enumeration values.</td>
</tr>
<tr>
<td></td>
<td>DeviceBlockInfo::NvMediaICPsiPhyMode phyMode</td>
<td></td>
</tr>
<tr>
<td>devblk_cdi.h</td>
<td>DevBlkCDIPWL::NvMediaPointDouble kneePoints[DEVBLK_CDI_MAX_PW_L_KNEEPOINTS]</td>
<td>Equivalent functionality defined by SIPL replaces NvMediaPointDouble. Migrate to newly provided structures. The new structures will have equivalent members to NvMediaPointDouble structures. The change is only in the naming convention.</td>
</tr>
<tr>
<td>CNvMDeserializer.hpp</td>
<td>CNvMCameraModuleCommon::SensorConnectionProperty::NvMediaICPInputFormat inputFormat</td>
<td>NvMediaICPInputFormat, NvMediaICPInterfaceType, NvMediaSurfaceType changes to an equivalent type defined by SIPL. Migrate to the newly provided enumerations and structures. The new enumerations and structures will be equivalent to existing enumerations and structures. Naming of individual enumeration values will also need to be updated.</td>
</tr>
<tr>
<td></td>
<td>CNvMCameraModule::CameraModuleConfig::NvMediaICPInterfaceType eInterface;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CNvMCameraModule::Property::SensorProperty::NvMediaICPInputFormat inputFormat;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CNvMCameraModule::Property::SensorProperty::NvMediaSurfaceType surfaceType;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CNvMDeserializer::DeserializerParams::NvMediaICPInterfaceType eInterface;</td>
<td></td>
</tr>
<tr>
<td>File</td>
<td>Current API or Structure that will Change</td>
<td>Change Description and Notes</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>nvmedia_icp_structs.h</td>
<td>CNvMDeserializer::DeserializerParams::NvMediaICPCsiPhyMode ePhyMode;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CNvMDeserializer::NvMediaICP InterfaceType m_eInterface;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CNvMDeserializer::NvMediaICP CsiPhyMode m_ePhyMode;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Header file changes</td>
<td>Internals will be redefined</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stop using the header file; a new header file, NvSiPLCapStructs.h, with updated structures and enumeration will be provided. This header contains structures and enumerations mentioned earlier in this document</td>
</tr>
<tr>
<td>nvmedia_isp_stat.h</td>
<td>Header file changes</td>
<td>Internals will be redefined</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stop using the header file; a new header file, NvSiPLISPStat.hpp, with updated structures and enumeration will be provided. This header contains structures and enumerations mentioned earlier in this document</td>
</tr>
</tbody>
</table>

NvMediaTensor APIs that take NvMediaDevice as input parameters were updated.

**Note:** The NvMediaDevice struct is typedef to void, and the APIs, NvMediaDeviceCreate() and NvMediaDeviceDestroy(), are marked deprecated and will be removed in 6.0.5.0 along with the libraries that contain them -- libnvmmedia.so and libnvmmedia_core.so. The updated versions of the following NvMediaTensor APIs will require a NULL value to be passed as input, instead of a valid NvMediaDevice pointer.

- NvMediaTensorCreateFromNvSciBuf()
- NvMediaTensorFillNvSciBufAttrs()
A recommendation for NvMediaTensor clients is to remove the use of NvMediaDeviceCreate() and NvMediaDeviceDestroy() APIs in their applications. Clients should also stop using libnvmedia.so and libnvmedia_core.so in their liner/makefiles.

The API signature has not changed for any of these NvMediaTensor APIs, but the implementation has changed. You must use the recompiled library.

The nvm_dlaSample application, which is part of the PDK/SDK, is updated to remove NvMediaDevice APIs and NULL value is passed as input for the above NvMedia Tensor APIs, where a NvMediaDevice handle is expected.

### Table 21: NvMediaTensor API Changes

<table>
<thead>
<tr>
<th>Module: NvMedia Tensor</th>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header File:</strong></td>
<td>nvmedia_tensor_nvscibuf.h</td>
<td></td>
</tr>
<tr>
<td><strong>API:</strong></td>
<td>NvMediaStatus NvMediaTensorCreateFromNvSciBuf( NvMediaDevice *device, NvSciBufObj nvSciBufObjInstance, NvMediaTensor **nvmTensor );</td>
<td>• NvMediaDevice is deprecated in 6.0 and the dependency has been removed. • A NULL value is passed as input instead of a valid NvMediaDevice pointer.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>NvMediaStatus status; NvSciBufObj bufObj; NvMediaTensor *tensor; status = NvMediaTensorCreateFromNvSciBuf( NULL, bufObj, &amp;tensor);</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong></td>
<td>nvmedia_tensor_nvscibuf.h</td>
<td></td>
</tr>
<tr>
<td><strong>API:</strong></td>
<td>NvMediaStatus NvMediaTensorFillNvSciBufAttrs( const NvMediaDevice *device, const NvMediaTensorAttr *attrs, uint32_t numAttrs, uint32_t flags, NvSciBufAttrList attr_h );</td>
<td>• NvMediaDevice is being deprecated in 6.0 and the dependency on it has been removed. • A NULL value is to be passed as input instead of a valid NvMediaDevice pointer.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>NvMediaStatus status; NVM_TENSOR_DEFINE_ATTR(tensorAttr); uint32_t numTensorAttr; NvSciBufAttrList attrlist; status = NvMediaTensorFillNvSciBufAttrs( NULL, tensorAttr, numTensorAttr, 0, attrlist);</td>
<td></td>
</tr>
</tbody>
</table>
NvMediaImage to NvSciBuf Migration

In NVIDIA DRIVE 6.0, NvMediaImage type is deprecated and replaced by NvSciBuf. All client applications using NvMediaImage structure must migrate to NvSciBuf. NvMedia Engine APIs will also use NvSciBuf.

In NVIDIA DRIVE OS 5.2, explicit engine synchronization using NvSciSync objects was optional but in NVIDIA DRIVE 6.0, it is mandatory.

Table 22. Deprecated NvMediaImage APIs

<table>
<thead>
<tr>
<th>Deprecated NvMediaImage-Related APIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaSurfaceGetVersion</td>
</tr>
<tr>
<td>NvMediaSurfaceFormatGetType</td>
</tr>
<tr>
<td>NvMediaSurfaceFormatGetAttrs</td>
</tr>
<tr>
<td>NvMediaImageGetVersion</td>
</tr>
<tr>
<td>NvMediaImageCreateNew</td>
</tr>
<tr>
<td>NvMediaImageDestroy</td>
</tr>
<tr>
<td>NvMediaImageGetEmbeddedData</td>
</tr>
<tr>
<td>NvMediaImageGetStatus</td>
</tr>
<tr>
<td>NvMediaImageSetTag</td>
</tr>
<tr>
<td>NvMediaImageGetTag</td>
</tr>
<tr>
<td>NvMediaImageGetTimeStamp</td>
</tr>
<tr>
<td>NvMediaImageGetGlobalTimeStamp</td>
</tr>
<tr>
<td>NvMediaImageGetTimeBase</td>
</tr>
<tr>
<td>NvMediaImageLock</td>
</tr>
<tr>
<td>NvMediaImageUnlock</td>
</tr>
<tr>
<td>NvMediaImagePutBits</td>
</tr>
<tr>
<td>NvMediaImageGetBits</td>
</tr>
</tbody>
</table>
Table 23. Migration from NvMediaImage to NvSciBuf

NvSciBuf has a similar model of allocating buffers. It is based on attributes, and the following table gives an overview of how to migrate NvMediaImage attributes to NvSciBuf.

<table>
<thead>
<tr>
<th>NvMediaImage Attributes</th>
<th>NvSciBuf Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVM_SURF_ATTR_WIDTH</td>
<td>NvSciBufImageAttrKey_PlaneWidth</td>
</tr>
<tr>
<td>NVM_SURF_ATTR_HEIGHT</td>
<td>NvSciBufImageAttrKey_PlaneHeight</td>
</tr>
<tr>
<td>NVM_SURF_ATTR_MIN_EMB_LINES_TOP</td>
<td>NvSciBufImageAttrKey_TopPadding</td>
</tr>
<tr>
<td>NVM_SURF_ATTR_MIN_EMB_LINES_BOTTOM</td>
<td>NvSciBufImageAttrKey_BottomPadding</td>
</tr>
</tbody>
</table>
| NVM_SURF_ATTR_CPU_ACCESS | NvSciBufGeneralAttrKey_NeedCpuAccess  
                         | NvSciBufGeneralAttrKey_EnableCpuCache  
                         | NvSciBufGeneralAttrKey_CpuNeedSwCacheCoherence |
| NVM_SURF_ATTR_ALLOC_TYPE | N/A |
| NVM_SURF_ATTR_PEER_VM_ID | N/A |
| NVM_SURF_ATTR_SCAN_TYPE | NvSciBufImageAttrKey_ScanType |
| NVM_SURF_ATTR_COLOR_STD_TYPE | NvSciBufImageAttrKey_PlaneColorStd |
| NVM_SURF_ATTR_SURF_TYPE  | NvSciBufImageAttrKey_PlaneColorFormat |
| NVM_SURF_ATTR_LAYOUT     | NvSciBufImageAttrKey_Layout |
| NVM_SURF_ATTR_DATA_TYPE  | NvSciBufImageAttrKey_PlaneDatatype |
| NVM_SURF_ATTR_MEMORY     | NvSciBufImageAttrKey_PlaneCount |
| NVM_SURF_ATTR_SUB_SAMPLING_TYPE | NvSciBufImageAttrKey_PlaneCount  
                              | NvSciBufImageAttrKey_PlaneColorFormat  
                              | NvSciBufImageAttrKey_PlaneBitsPerPixel |
| NVM_SURF_ATTR_BITS_PER_COMPONENT | NvSciBufImageAttrKey_PlaneBitsPerPixel |
| NVM_SURF_ATTR_COMPONENT_ORDER | NvSciBufImageAttrKey_PlaneColorFormat |
NvMedia EGL Stream to NvSciStreams Migration

In NVIDIA DRIVE OS 5.2, NvMedia APIs natively support sending and receiving NvMediaVideoSurface and NvMediaImage type surfaces over an EGL Stream connection both as a producer and a consumer.

In NVIDIA DRIVE 6.0, NvMediaVideoSurface and NvMediaImage types, and NvMedia EGL Stream support are deprecated. NvMediaVideoSurface and NvMediaImage types are replaced by NvSciBuf, EGL Stream support is replaced by NvSciStreams.

Table 24. Deprecated NvMedia EGL Stream APIs in NVIDIA DRIVE 6.0

<table>
<thead>
<tr>
<th>Deprecated NvMedia EGL Stream APIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaEglStreamGetVersion</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerCreate</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerSetAttributes</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerDestroy</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerPostSurface</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerGetSurface</td>
</tr>
<tr>
<td>NvMediaEglStreamConsumerCreate</td>
</tr>
<tr>
<td>NvMediaEglStreamConsumerDestroy</td>
</tr>
<tr>
<td>NvMediaEglStreamConsumerAcquireSurface</td>
</tr>
<tr>
<td>NvMediaEglStreamConsumerReleaseSurface</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerPostImage</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerGetImage</td>
</tr>
<tr>
<td>NvMediaEglStreamConsumerAcquireImage</td>
</tr>
<tr>
<td>NvMediaEglStreamConsumerReleaseImage</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerPostMetaData</td>
</tr>
<tr>
<td>NvMediaEglStreamConsumerAcquireMetaData</td>
</tr>
</tbody>
</table>

EGL Stream and NvSciStreams are both based on a producer/consumer model. When a stream connection is established between a producer and a consumer, the producer posts
buffer objects to the stream, which is received by the consumer. Refer to the NvSciStreams documentation regarding establishing stream communication between a producer and consumer.

The following table shows a typical high-level NvMedia Producer programming sequence and the corresponding NvSciStreams equivalent. This sequence does not provide details regarding the transfer of synchronization objects.

Table 25. NvMedia Producer and NvSciStreams Programming Sequences

<table>
<thead>
<tr>
<th>NvMedia EGL Stream Producer</th>
<th>NvSciStreams Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>// Generate Image</td>
<td>// Query event</td>
</tr>
<tr>
<td>...</td>
<td>NvSciStreamBlockEventQuery()</td>
</tr>
<tr>
<td>// Post Image to EGL Stream</td>
<td>// Get packet to get index to Image</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerPostImage()</td>
<td>NvSciStreamProducerPacketGet()</td>
</tr>
<tr>
<td>// Get the Image back from EGL Stream</td>
<td>// Generate Image</td>
</tr>
<tr>
<td>NvMediaEglStreamProducerGetImage()</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>// Post Image to NvSciStreams</td>
</tr>
<tr>
<td></td>
<td>NvSciStreamProducerPacketPresent()</td>
</tr>
</tbody>
</table>

The following table shows a typical high-level NvMedia Consumer programming sequence and the corresponding NvSciStreams equivalent. This sequence does not provide details regarding the transfer of synchronization objects.

Table 26. NvMedia Consumer and NvSciStreams Programming Sequences

<table>
<thead>
<tr>
<th>NvMedia EGL Stream Consumer</th>
<th>NvSciStreams Consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>// Get frame status</td>
<td>// Wait for event</td>
</tr>
<tr>
<td>eglQueryStreamKHR()</td>
<td>NvSciStreamBlockEventQuery()</td>
</tr>
<tr>
<td>// Receive Image from EGL Stream</td>
<td>// Receive packet to get index to Image</td>
</tr>
<tr>
<td>// Process Image</td>
<td>// Process Image</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>// Release Image back to EGL Stream</td>
<td>// Release Image back to NvSciStreams</td>
</tr>
</tbody>
</table>
NvMedia Image Processing Pipeline (IPP) Changes Introduced in DRIVE OS 5.1.15.0

NvMedia Image Processing Pipeline (IPP) APIs are deprecated after the 5.1.15.0 release. Instead, use NvMedia SIPL APIs. The deprecated APIs and the associated sample applications will be removed in the [5.2.0.0] release.

In NVIDIA DRIVE™ OS 5.1, the NvMedia Image Processing Pipeline (IPP) framework provides the interface to capture RAW images from camera sensors and process them using the NVIDIA DRIVE AGX Xavier™ hardware Image Signal Processing (ISP).

The framework provides various APIs to set up image capture and processing pipelines. NvMedia IPP APIs are typically used in conjunction with ExtImgDev APIs to setup the complete image capture and processing pipelines. ExtImgDev APIs provide interfaces to program the external image devices like image sensors, serializers and de-serializers.

NVIDIA DRIVE™ OS 5.1 platforms have been supporting a new camera framework called SIPL designed for safety use cases. The SIPL framework provides a single set of C++ interfaces to instantiate imaging pipeline(s) in Xavier-based platforms. It supports both raw image capture and ISP processed output.

Starting in NVIDIA DRIVE™ OS 5.1.15.0, users should port their IPP applications to SIPL interfaces. NvMedia IPP is scheduled to be removed from DRIVE OS release 5.2.0.0 and later versions. NvMedia Image Processing Pipeline is removed from the PDK with version 6.0.4.

Due to the different levels of abstraction, a direct mapping of NvMedia IPP interfaces to SIPL APIs is not feasible. This section includes a comparison of API sequences for typical image processing use cases.

All unused or unsupported legacy components, such as ISC and VMP, are deprecated.

Capture and Process from a Live Camera

This section details the API call sequence comparison for capturing and processing of frames from a live camera.

Table 27. NvMedia IPP and SIPL API Call Sequence Comparison

<table>
<thead>
<tr>
<th>Phase</th>
<th>NvMedia IPP API</th>
<th>NvMedia SIPL API</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>See nvmipp_raw source for details.</td>
<td>See nvsipl_camera source for details.</td>
</tr>
<tr>
<td>Initialization</td>
<td>1. Set up ExtImgDevparams ExtImgDevInit NvMediaIPPManagerCreate NvMediaIPPPipelineCreate</td>
<td>1. Create INvSIPLCamera instance INvSIPLCamera::GetInstance</td>
</tr>
</tbody>
</table>

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NVIDIA DRIVE OS 5.1 to 6.0 SDK Migration Guide
<table>
<thead>
<tr>
<th>Phase</th>
<th>NvMedia IPP API</th>
<th>NvMedia SIPL API</th>
</tr>
</thead>
</table>
| 2. Create sensor control component.  
   NvMediaIPPComponentCreateNew(ISC) | 2. Set up Platform config data structure to describe the camera. INvSIPLQuery interfaces can be used to fetch one of the supported platform configurations  
   INvSIPLCamera::SetPlatformCfg | |
| 3. Create capture component using ExtIImgDev properties  
   NvMediaIPPComponentCreateNew(ICP)  
   NvMediaIPPComponentAddToPipeline | 3. Set pipeline config describing what outputs are needed. Get back queues to receive the output images  
   INvSIPLCamera::SetPipelineCfg | |
| 4. Specify the buffer pool properties and ISP output properties  
   NvMediaIPPComponentCreateNew(ISP) | 4. Initialize the camera  
   INvSIPLCamera::Init | |
| 5. Specify the algorithm configuration  
   NvMediaIPPComponentCreateNew(ALG) | 5. Get the image attributes.  
   INvSIPLCamera::GetImageAttributes | |
| 6. Create the output component  
   NvMediaIPPComponentCreateNew(OUTPUT) | 6. Allocate buffers using NvSciBuf APIs  
   Register the buffers with SIPL  
   INvSIPLCamera::RegisterImages | |
| 7. Use multiple  
   NvMediaIPPComponentAttachToAttach components | 7. Get NvSciSync attributes  
   INvSIPLCamera::FillNvSciSyncAttrList | |
   INvSIPLCamera::RegisterNvSciSyncObj | |
<p>| | 9. Register the Auto Control plugin and ISP calibration data to use | |</p>
<table>
<thead>
<tr>
<th>Phase</th>
<th>NvMedia IPP API</th>
<th>NvMedia SIPL API</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>See nvmipp_raw source for details.</td>
<td>See nvsipl_camera source for details.</td>
</tr>
</tbody>
</table>
| Start | 1. Start the pipeline.  
      | NvMediaIPPPipelineStart  
      | 2. Start ExtImgDev.  
      | ExtImgDevStart | 1. Start the camera.  
      | INvSIPLCamera::RegisterAutoControlPlugin |
| Runtime | 1. In an application thread:  
      | 1a. Get the output from NvMedia IPP.  
      | NvMediaIPPComponentGetOutput  
      | 1b. Consume the output  
      | 1c. Return the consumed buffer back to IPP  
      | NvMediaIPPComponentReturnOutput | 1. In an application thread:  
      | 1a. Get the output buffer from the queue[s] returned in the SetPipelineCfg API  
      | INvSIPLFrameCompletionQueue::Get  
      | 1b. Get the post-fence of the buffer  
      | INvSIPLBuffer::GetEOFNvSciSyncFence  
      | 1c. Wait on the returned on the post-fence and consume the buffer  
      | 1d. Add pre-fences to the buffer [if any]  
      | INvSIPLBuffer::AddNVSciSyncPrefence  
      | 1e. Release the reference.  
      | INvSIPLBuffer::Release |

Reprocess a RAW File Using Hardware ISP

This section details the API call sequence comparison for reprocessing a RAW file using hardware ISP.
<table>
<thead>
<tr>
<th>Phase</th>
<th>NvMedia IPP API</th>
<th>NvMedia SIPL API</th>
</tr>
</thead>
</table>
| Initialization| 1. Set up ExtImgDev params ExtImgDevInit NvMediaIPPManagerCreate NvMediaIPPPipelineCreate  
               | 2. Create the sensor control component. NvMediaIPPComponentCreate New(ISC)  
               | 3. Create file reader component. NvMediaIPPComponentCreate New(FILE_READER)  
               | 4. Specify buffer pool properties and ISP output properties. NvMediaIPPComponentCreate New(ISP)  
               | 5. Specify algorithm configuration. NvMediaIPPComponentCreate New(ALG)  
               | 6. Create output component. NvMediaIPPComponentCreate New(OUTPUT)  
               | 7. Use multiple NvMediaIPPComponentAttach to attach components  
               | 1. Create INvSIPLCamera instance  
               | INvSIPLCamera::GetInstance  
               | 2. Set up Platform config data structure to describe the camera. INvSIPLQuery interfaces can be used to fetch one of the supported platform configurations INvSIPLCamera::SetPlatformCfg  
               | 3. Set pipeline config describing what outputs are needed and image group writer callback. Get back queues to receive the output images INvSIPLCamera::SetPipelineCfg  
               | 4. Initialize the camera. INvSIPLCamera::Init  
               | 5. Get the image attributes INvSIPLCamera::GetImageAttributes  
               | 6. Allocate buffers using NvSciBuf APIs Register the buffers with SIPL INvSIPLCamera::RegisterImages  

See nvmipp_raw source for details. 
See nvsipl_camera source for details.
<table>
<thead>
<tr>
<th>Phase</th>
<th>NvMedia IPP API</th>
<th>NvMedia SIPL API</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>See nvmipp_raw source for details.</td>
<td>See nvsipl_camera source for details.</td>
</tr>
</tbody>
</table>

**Start**

1. Start the pipeline.
   - NvMediaIPPpipelineStart

2. Start ExtImgDev.
   - ExtImgDevStart

1. Start the camera.
   - INvSIPLCamera::Start

**Runtime**

1. In an application thread:
   1a. Get the output from NvMediaIPP.
      - NvMediaIPPComponentGetOutput

   1b. Consume the output.

   1c. Return the consumed buffer back to IPP.
      - NvMediaIPPComponentReturnOutput

   1. Populate the image with RAW data in the image group writer callback implemented by the app and register with the SIPL

   2. In an application thread:

   2a. Get the output buffer from the queue[s] returned in the SetPipelineCfpg API.
      - INvSIPLFrameCompletionQueue::Get

   1b. Get the post-fence of the buffer
      - INvSIPLBuffer::GetEOFNvSciSyncFence

   1c. Wait on the returned on the post-fence and consume the buffer

   - INvSIPLCamera::RegisterNvSciSyncObj

9. Register the Auto Control plugin and ISP calibration data to use
   - INvSIPLCamera::RegisterAutoControlPlugin
## NvMedia Array and NvMedia CVScratchPad Deprecation

In NVIDIA DRIVE 6.0, NvMedia Array and NvMedia CVScratchPad APIs are deprecated. These APIs are intended for use with Legacy NvMedia IOSTIArray and NvMedia VPIIArray and CVScratchPad) components, which are not are not part of NVIDIA DRIVE 6.0.

## NvMedia ISC Deprecation

In NVIDIA DRIVE 6.0, NvMedia ISC APIs are deprecated. These APIs were intended for use with Legacy NvMedia IPP component, which is not part of NVIDIA DRIVE 6.0.

## NvMedia Core Deprecation

In NVIDIA DRIVE 6.0, NvMediaDeviceCreate and NvMediaDeviceDestroy APIs are marked as deprecated and will be removed in 6.0.5.0 along with the libraries that contain them – libnvmedia.so and libnvmedia_core.so. The NvMediaDevice handle did not carry valuable information and was retained in NVIDIA DRIVE 5.2 for legacy reasons.

Clients should remove the use of NvMediaDeviceCreate and NvMediaDeviceDestroy APIs in applications. Additionally, clients should stop using libnvmedia.so and libnvmedia_core.so in linker/makefiles.

NvMediaCoreGetVersion and NvMediaReleaseVersion APIs are deprecated and removed. These APIs don’t add value because the changes to NvMedia Core are minimal and only reflect the state of the headers.
Unused structs and enums such as `NvMediaPoint`, `NvMediaPointFloat`, `NvMediaPointDouble`, `NvMediaColorStandard`, `NvMediaTimeBase` and `NvMediaGlobalTime` are removed.

## NvMedia 2D: Migrating from 5.2 to 6.0

### Table 29. Possible Sequences for API Calls

<table>
<thead>
<tr>
<th>DRIVE OS 5.2</th>
<th>DRIVE OS 6.0</th>
</tr>
</thead>
</table>
| /* Initialization */
NvMedia2D* handle =
NvMedia2DCreate(device);
NvMedia2DImageRegister(handle, &srcImg, NVMEDIA_ACCESS_MODE_READ);
NvMedia2DImageRegister(handle, &dstImg, NVMEDIA_ACCESS_MODE_READ_WRITE); |
| /* Initialization */
NvMedia2DCreate(&handle, NULL);
NvMedia2DFillNvSciBufAttrList(handle, srcBufAttrList);
NvMedia2DFillNvSciBufAttrList(handle, dstBufAttrList);
NvMedia2DFillNvSciSyncAttrList(handle, preSyncObjAttrsList, NVMEDIA_PRESYNCOBJ);
NvMedia2DFillNvSciSyncAttrList(handle, eofSyncObjAttrsList, NVMEDIA_EOFSYNCOBJ);
NvMedia2DRegisterNvSciBufObj(handle, srcBuf);
NvMedia2DRegisterNvSciBufObj(handle, dstBuf);
NvMedia2DRegisterNvSciSyncObj(handle, NVMEDIA_PRESYNCOBJ, preSyncObj);
NvMedia2DRegisterNvSciSyncObj(handle, NVMEDIA_EOFSYNCOBJ, eofSyncObj); |
| /* Runtime */
NvMedia2DBlitParameters p;
p.validFields = NVMEDIA_2D_BLIT_PARAMS_FILTER | NVMEDIA_2D_BLIT_PARAMS_DST_TRANSFORM;
p.filter = filter;
p.dstTransform = transform;
NvMedia2DBlitEx(handle, &dstImg, &dstRect, &srcImg, &srcRect, &p, NULL); |
| /* Runtime */
NvMedia2DComposeParameters params;
NvMedia2DGetComposeParameters(handle, &params);
NvMedia2DInsertPreNvSciSyncFence(handle, params, &preFence);
NvMedia2DSetNvSciSyncObjForEOF(handle, params, eofSyncObj);
NvMedia2DSetSrcNvSciBufObj(handle, params, 0, srcBuf);
NvMedia2DSetDstNvSciBufObj(handle, params, dstBuf);
NvMedia2DSetSrcGeometry(handle, params, 0, &srcRect, &dstRect, transform);
NvMedia2DSetSrcFilter(handle, params, 0, filter); |
<table>
<thead>
<tr>
<th>DRIVE OS 5.2</th>
<th>DRIVE OS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMedia2DCompose(result, handle, params, &amp;result);</td>
<td>NvMedia2DCompose(handle, params, &amp;result);</td>
</tr>
<tr>
<td>NvMedia2DGetEOFNvSciSyncFence(handle, &amp;result, &amp;eofFence);</td>
<td></td>
</tr>
<tr>
<td>/* De-initialization */</td>
<td>/* De-initialization */</td>
</tr>
<tr>
<td>NvMedia2DImageUnRegister(handle, &amp;srcImg);</td>
<td>NvMedia2DUnderegisterNvSciBufObj(handle, srcBuf);</td>
</tr>
<tr>
<td>NvMedia2DImageUnRegister(handle, &amp;dstImg);</td>
<td>NvMedia2DUnderegisterNvSciBufObj(handle, dstBuf);</td>
</tr>
<tr>
<td>NvMedia2DDestroyEx(handle);</td>
<td>NvMedia2DUnderegisterNvSciSyncObj(handle, presyncObj);</td>
</tr>
<tr>
<td></td>
<td>NvMedia2DUnderegisterNvSciSyncObj(handle, eofsyncObj);</td>
</tr>
<tr>
<td></td>
<td>NvMedia2DDestroyEx(handle);</td>
</tr>
</tbody>
</table>

Table 30. NvMedia 2D

Module: NvMedia 2D

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header File:</td>
<td>Function signature is changed to:</td>
</tr>
<tr>
<td>nvmedia_vpi.h</td>
<td>Header File:</td>
</tr>
<tr>
<td>Header File:</td>
<td>nvmedia_2d.h</td>
</tr>
<tr>
<td>nvmedia_2d.h</td>
<td>API:</td>
</tr>
<tr>
<td>API:</td>
<td>NvMediaStatus</td>
</tr>
<tr>
<td>NvMedia2D *</td>
<td>NvMedia2DCreate(</td>
</tr>
<tr>
<td>NvMedia2DCreate(</td>
<td>NvMedia2D **handle,</td>
</tr>
<tr>
<td>NvMediaDevice *device</td>
<td>NvMedia2DAttributes const * const attr</td>
</tr>
<tr>
<td>)</td>
<td>);</td>
</tr>
<tr>
<td></td>
<td>The NvMedia2D* return value is changed to be</td>
</tr>
<tr>
<td></td>
<td>delivered to caller through an out parameter, and</td>
</tr>
<tr>
<td></td>
<td>the function now returns an error code.</td>
</tr>
<tr>
<td></td>
<td>NvMediaDevice is no longer required to create</td>
</tr>
<tr>
<td></td>
<td>NvMedia 2D context.</td>
</tr>
<tr>
<td>Module: NvMedia 2D</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Header File and API</td>
<td>A possibility to pass attributes controlling memory allocation for NvMedia 2D context is added.</td>
</tr>
</tbody>
</table>

**Header File:**
nvmedia_2d.h

**API:**
NvMediaStatus
NvMedia2DDestroyEx(
    NvMedia2D *i2d
);  

Function signature is changed to:

**Header File:**
nvmedia_2d.h

**API:**
NvMediaStatus
NvMedia2DDestroy(
    NvMedia2D *handle
);  

The function name has changed. Function NvMedia2DDestroy() was deprecated in 5.2. Its name is now reused in the function replacing NvMedia2DDestroyEx() in 6.0.

**Header File:**
nvmedia_2d.h

**API:**
NvMediaStatus
NvMedia2DImageRegister(
    const NvMedia2D *i2d,
    const NvMediaImage *image,
    NvMediaAccessMode accessMode
);  

NvMediaImage is no longer used. Instead, NvSciBufObj is used for image data and NvSciSyncObj for synchronizing NvMedia 2D operations with other tasks.

NvSciBufObjs need to be registered with NvMedia 2D before they are used with function

**Header File:**
nvmedia_2d_sci.h

**API:**
NvMedia2DRegisterNvSciBufObj()

The attribute lists used to create the registered NvSciBufObjs need to have NvMedia 2D mandatory attributes set with function

**Header File:**
nvmedia_2d_sci.h
## Module: NvMedia 2D

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
</table>
| **API:**
NvMedia2DFillNvSciBufAttrList()  
NvSciSyncObjs need to be registered with NvMedia 2D before they are used with function  
**Header File:**  
vmedia_2d_sci.h  
**API:**
NvMedia2DRegisterNvSciSyncObj()  
The attribute lists used to create the registered NvSciSyncObjs need to have NvMedia 2D mandatory attributes set with function  
**Header File:**  
vmedia_2d_sci.h  
**API:**
NvMedia2DFillNvSciSyncAttrList()  

**Header file:**  
vmedia_2d_sci.h  
**API:**
NvMediaStatus  
NvMedia2DImageUnRegister(  
    const NvMedia2D *i2d,  
    const NvMediaImage *image  
);  

NvMediaImage is no longer used. Instead, NvSciBufObj is used for image data and NvSciSyncObj for synchronizing NvMedia 2D operations with other tasks  
NvSciBufObjs need to be unregistered with NvMedia 2D after they are no longer used with function  
**Header File:**  
vmedia_2d_sci.h  
**API:**
NvMedia2DUnregisterNvSciBufObj()
<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module: NvMedia 2D</strong></td>
<td>NvSciSyncObjs need to be unregistered with NvMedia 2D after they are no longer used with function</td>
</tr>
<tr>
<td><strong>Header File:</strong></td>
<td>nvmedia_2d_sci.h</td>
</tr>
<tr>
<td><strong>API:</strong></td>
<td>NvMedia2DUregisterNvSciSyncObj()</td>
</tr>
</tbody>
</table>

**Header File:**
nvmedia_2d.h

**API:**
NvMediaStatus
NvMedia2DBlitEx(
    const NvMedia2D *i2d,
    const NvMediaImage *dstSurface,
    const NvMediaRect *dstRect,
    const NvMediaImage *srcSurface,
    const NvMediaRect *srcRect,
    const NvMedia2DBlitParameters params,
    NvMedia2DBlitParametersOut *paramsOut
);  

NvMediaImage is no longer used. Instead, NvSciBufObj is used for image data and NvSciSyncObj for synchronizing NvMedia 2D operations with other tasks.

The parameters of an NvMedia 2D operation are no longer passed directly to the function triggering the processing, but instead they are now configured to a separate parameters object. New parameters object needs to be acquired for each frame with function

**Header File:**
nvmedia_2d.h

**API:**
NvMedia2DGetComposeParameters()  
The source and destination surfaces are configured to the parameters object with functions

**Header File:**
nvmedia_2d_sci.h

**API:**
NvMedia2DSetsrcNvSciBufObj()
NvMedia2DSetDstNvSciBufObj()}
## Module: NvMedia 2D

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
</table>
| **Header File:** nvmedia_2d.h  
**API:** NvMedia2DSetsrcGeometry() | The source and destination rectangles, and the 2D rotation/translation to apply are configured to the parameters object with function |
| **Header File:** nvmedia_2d_sci.h  
**API:** NvMedia2DInsertPreNvSciSyncFence() | If there is a need to wait for some other task (for example another HW engine providing input frame to NvMedia 2D in an image processing pipeline) to complete before starting the NvMedia 2D operation, a pre-fence can be configured to the parameters object with function |

If there is a need to wait for the NvMedia 2D operation to complete, an end-of-frame fence can be requested to be generated by the operation. This is done by configuring an end-of-frame NvSciSyncObj to the parameters object with function |
<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header File:</strong> nvmedia_2d_sci.h</td>
<td></td>
</tr>
<tr>
<td><strong>API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMedia2DSetNvSciSyncObjforEOF()</td>
<td></td>
</tr>
<tr>
<td>The end-of-frame fence can be retrieved after triggering the operation with function</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong> nvmedia_2d_sci.h</td>
<td></td>
</tr>
<tr>
<td><strong>API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMedia2DGetEOFNvSciSyncFence()</td>
<td></td>
</tr>
<tr>
<td>Triggering a new NvMedia 2D operation using a parameters object is done with function</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong> nvmedia_2d.h</td>
<td></td>
</tr>
<tr>
<td><strong>API:</strong></td>
<td></td>
</tr>
<tr>
<td>NvMedia2DCompose()</td>
<td></td>
</tr>
<tr>
<td>As a new feature, there’s now a possibility to use multiple source surfaces for a single NvMedia 2D operation. This is done by identifying the different surfaces with an index parameter passed to the functions with “Src” in their name.</td>
<td></td>
</tr>
<tr>
<td>As a new feature, there’s now a possibility to configure the blending mode to use with each source surface to the parameters object. This is done with function</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong> nvmedia_2d.h</td>
<td></td>
</tr>
</tbody>
</table>
NVIDIA DRIVE OS 6.0 Migration Guide

Module: NvMedia 2D

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>API: NvMedia2DSetSrcBlendMode()</td>
<td></td>
</tr>
</tbody>
</table>

NvMedia Lens Distortion Correction (LDC): Migrating from 5.2 to 6.0

Table 31. Possible Sequences for API Calls

<table>
<thead>
<tr>
<th>DRIVE OS 5.2</th>
<th>DRIVE OS 6.0</th>
</tr>
</thead>
</table>
| /* Initialization */
NvMediaLDCInitParams initParams;
initParams.ldcMode = NVMEDIA_LDC_MODE_GEOTRANS;
initParams.geoTransParams.geoTransMode = NVMEDIA_GEOTRANS_MODE_FEED_MAPPING;
initParams.geoTransParams.filter = filter;
initParams.geoTransParams.bitMaskEnable = NVMEDIA_TRUE;
inNMediaLDCCreateNew(
    device,
    &handle,
    srcW,
    srcH,
    &srcRect,
    dstW,
    dstH,
    &dstRect,
    &initParams
); NvMediaLDCFeedSparseWarpMap(handle, &warpMap); |
| /* Initialization */
NvMediaLdcCreate(&handle, NULL);
NvMediaLdcFillNvSciBufAttrList(handle, srcBufAttrList);
NvMediaLdcFillNvSciBufAttrList(handle, dstBufAttrList);
NvMediaLdcFillNvSciBufAttrList(handle, xsobelDstBufAttrList);
NvMediaLdcFillNvSciBufAttrList(handle, xsobelDsDstBufAttrList);
NvMediaLdcFillNvSciSyncAttrList(handle, preSyncObjAttrsList, NVMEDIA_PRESYNCOBJ);
NvMediaLdcFillNvSciSyncAttrList(handle, eofSyncObjAttrsList, NVMEDIA_EOFSYNCOBJ);
NvMediaLdcRegisterNvSciBufObj(handle, srcBuf);
NvMediaLdcRegisterNvSciBufObj(handle, dstBuf);
NvMediaLdcRegisterNvSciBufObj(handle, xsobelDstBuf);
NvMediaLdcRegisterNvSciBufObj(handle, xsobelDsDstBuf);
NvMediaLdcRegisterNvSciSyncObj(handle, NVMEDIA_PRESYNCOBJ, preSyncObj); |
<table>
<thead>
<tr>
<th>DRIVE OS 5.2</th>
<th>DRIVE OS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaLdcRegisterNvSciSyncObj(handle, NVMEDIA_EOFSYNCOBJ, eofSyncObj); NvMediaLdcParameters params; NvMediaLdcCreateParameters(handle, &amp;paramsAttrs, &amp;params); NvMediaLdcSetNvSciSyncObjForEOF(handle, params, eofSyncObj); NvMediaLdcSetFilter(handle, params, filter); NvMediaLdcSetGeometry(handle, params, &amp;srcRect, &amp;dstRect); NvMediaLdcSetWarpMapParameters(handle, params, &amp;warpMapParams); NvMediaLdcSetMaskMapParameters(handle, params, &amp;maskMapParams);</td>
<td>/* Runtime */ NvMediaLdCCtrlParams ctrlParams; ctrlParams.xSobelMode = NVMEDIA_GEOTRANS_ENABLE_XSOBEL_ENABLE_DS; NvMediaLDCProcess(handle, NULL, srcImg, dstImg, xsobelImg, xsobelDsImg, &amp;ctrlParams);</td>
</tr>
<tr>
<td>NvMediaLdcSetSrcNvSciBufObj(handle, params, srcBuf); NvMediaLdcSetDstNvSciBufObj(handle, params, dstBuf); NvMediaLdcSetXSobelDstSurface(handle, params, xsobelDstBuf); NvMediaLdcSetDownsampledXSobelDstSurface(handle, params, xsobelDsDstBuf); NvMediaLdcResult result; NvMediaLdcProcess(handle, params, &amp;result); NvMediaLdcGetEOFNvSciSyncFence(handle, &amp;result, &amp;eofFence);</td>
<td>/* Runtime */ NvMediaLdcInsertPreNvSciSyncFence(handle, params, preFence); NvMediaLdcSetSrcNvSciBufObj(handle, params, srcBuf); NvMediaLdcSetDstNvSciBufObj(handle, params, dstBuf); NvMediaLdcSetXSobelDstSurface(handle, params, xsobelDstBuf); NvMediaLdcSetDownsampledXSobelDstSurface(handle, params, xsobelDsDstBuf); NvMediaLdcResult result; NvMediaLdcProcess(handle, params, &amp;result); NvMediaLdcGetEOFNvSciSyncFence(handle, &amp;result, &amp;eofFence);</td>
</tr>
<tr>
<td>/* De-initialization */ NvMediaLDCDestroy(handle);</td>
<td>/* De-initialization */ NvMediaLdcDestroyParameters(handle, params); NvMediaLdcUnregisterNvSciBufObj(handle, srcBuf); NvMediaLdcUnregisterNvSciBufObj(handle, dstBuf); NvMediaLdcUnregisterNvSciBufObj(handle, xsobelDstBuf); NvMediaLdcUnregisterNvSciBufObj(handle, xsobelDsDstBuf); NvMediaLdcUnregisterNvSciSyncObj(handle, preSyncObj);</td>
</tr>
<tr>
<td>Module: NvMedia LDC</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>Header File:</td>
<td></td>
</tr>
<tr>
<td>nvmedia_ldc.h</td>
<td></td>
</tr>
<tr>
<td>API:</td>
<td></td>
</tr>
<tr>
<td>NvMediaStatus</td>
<td></td>
</tr>
<tr>
<td>NvMediaLdCCreateNew(const NvMediaDevice *device, NvMediaLDC **pldc, const uint16_t srcWidth, const uint16_t srcHeight, const NvMediaRect *srcRect, const uint16_t dstWidth, const uint16_t dstHeight, const NvMediaRect *dstRect, const NvMediaLDCInitParams *initParams);</td>
<td></td>
</tr>
</tbody>
</table>

NvMediaDevice is no longer required to create NvMedia LDC context. The context is created with function

<table>
<thead>
<tr>
<th>Header File:</th>
</tr>
</thead>
<tbody>
<tr>
<td>nvmedia_ldc.h</td>
</tr>
<tr>
<td>API:</td>
</tr>
<tr>
<td>NvMediaStatus</td>
</tr>
<tr>
<td>NvMediaLdcCreate(NvMediaLdc **const handle, NvMediaLdcAttributes const *const attr);</td>
</tr>
</tbody>
</table>

The NvMediaLdcAttributes parameter controls the amount of memory allocated for the context.

The surface dimensions, rectangles, filtering, regions, matrix coefficients etc. are no longer passed to the context creation function. Instead, they are now configured to a separate parameters object created with the function

<table>
<thead>
<tr>
<th>Header File:</th>
</tr>
</thead>
<tbody>
<tr>
<td>nvmedia_ldc.h</td>
</tr>
<tr>
<td>API:</td>
</tr>
<tr>
<td>NvMediaStatus</td>
</tr>
<tr>
<td>NvMediaLdcCreateParameters(</td>
</tr>
</tbody>
</table>
### Module: NvMedia LDC

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaLdc *const handle, NvMediaLdcParametersAttributes const *const attr, NvMediaLdcParameters *const params);</td>
<td>The NvMediaLdcParametersAttributes parameter controls which features [such as TNR3 and mask map] can be used with the allocated parameters object and how much memory is allocated for them. The pixel interpolation filter is configured to the parameters object with function <strong>Header File:</strong> nvmedia_ldc.h <strong>API:</strong> NvMediaLdcSetFilter() The rectangles are configured to the parameters object with function <strong>Header File:</strong> nvmedia_ldc.h <strong>API:</strong> NvMediaLdcSetGeometry() The IPT [perspective] matrix and related region configuration are configured to the parameters object with function <strong>Header File:</strong> nvmedia_ldc.h <strong>API:</strong></td>
</tr>
<tr>
<td>Header File and API</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------</td>
</tr>
<tr>
<td>NvMediaLdcSetIptParameters()</td>
<td>The warp map and related region configuration are configured to the parameters object with function</td>
</tr>
<tr>
<td>Header File: nvmedia_ldc.h</td>
<td></td>
</tr>
<tr>
<td>API: NvMediaLdcSetWarpMapParameters()</td>
<td>The mask map is configured to the parameters object with function</td>
</tr>
<tr>
<td>Header File: nvmedia_ldc.h</td>
<td></td>
</tr>
<tr>
<td>API: NvMediaLdcSetMaskMapParameters()</td>
<td>The TNR3 parameters are configured to the parameters object with function</td>
</tr>
<tr>
<td>Header File: nvmedia_ldc.h</td>
<td></td>
</tr>
<tr>
<td>API: NvMediaLdcSetTnrParameters()</td>
<td></td>
</tr>
<tr>
<td>Header file: nvmedia_ldc.h</td>
<td>Any created parameters objects need to be destroyed with function</td>
</tr>
<tr>
<td>API: NvMediaStatus NvMediaLDCDestroy( NvMediaLDC *ldc );</td>
<td></td>
</tr>
<tr>
<td>Header File: nvmedia_ldc.h</td>
<td></td>
</tr>
<tr>
<td>API:</td>
<td></td>
</tr>
</tbody>
</table>
### Module: NvMedia LDC

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NvMediaLdcDestroyParameters() before destroying the NvMedia LDC context. The context is destroyed with function</td>
<td></td>
</tr>
<tr>
<td><strong>Header File:</strong> nvmedia_ldc.h</td>
<td><strong>API:</strong> NvMediaLdcDestroy();</td>
</tr>
</tbody>
</table>

**Header File:** nvmedia_ldc.h

**API:**

NvMediaStatus
NvMediaLDCFeedSparseWarpMap(
    NvMediaLDC *ldc,
    const NvMediaLDCSparseWarpMap *map
);  The warp map is now configured to a parameters object with function

**Header File:** nvmedia_ldc.h

**API:**

NvMediaLdcSetWarpMapParameters()

Only floating point format is supported for the map control points.

**Header file:** nvmedia_ldc.h

**API:**

NvMediaStatus
NvMediaLDCMappingGen(
    NvMediaLDC *ldc
);  Generating a warp map based on a lens model is now done with function

**Header File:** nvmedia_ldc_util.h

**API:**

NvMediaLdcGenWarpMap()

**Header file:** nvmedia_ldc.h

**API:**

NvMediaStatus

TNR2 is no longer supported.
<table>
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<tr>
<th>Module: NvMedia LDC</th>
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</table>
| NvMediaLDCUpdateTNR2Params (  
    NvMediaLDC *ldc,  
    const NvMediaTNR2Params *tnr2Params  
); | The TNR3 parameters are configured to a parameters object with function |
| **Header File:** | nvmedia_ldc.h |
| **API:** | NvMediaStatus |
| NvMediaLDCUpdateTNR3Params (  
    const NvMediaLDC *ldc,  
    const NvMediaTNR3Params *tnr3Params  
); | NvMediaImage is no longer used. Instead, NvSciBufObj is used for image data and NvSciSyncObj for synchronizing NvMedia LDC operations with other tasks. |
| **Header File:** | nvmedia_ldc.h |
| **API:** | NvMediaStatus |
| NvMediaLDCProcess (  
    const NvMediaLDC *ldc,  
    NvMediaImage *prevSurface,  
    NvMediaImage *curSurface,  
    NvMediaImage *outputSurface,  
    NvMediaImage *xSobel,  
    NvMediaImage *downSample,  
    const NvMediaLDCCtrlParams *ldcCtrlParams  
); | NvSciBufObjs need to be registered with NvMedia LDC before they are used with function |
<p>| <strong>Header File:</strong> | nvmedia_ldc_sci.h |
| <strong>API:</strong> | NvMediaLdcRegisterNvSciBufObj() |
| The attribute lists used to create the registered NvSciBufObj need to have NvMedia LDC mandatory attributes set with function |</p>
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<td></td>
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<tr>
<td><strong>Header File:</strong></td>
<td>nvmedia_ldc_sci.h</td>
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<tr>
<td><strong>API:</strong></td>
<td>NvMediaLdcFillNvSciSyncAttrList()</td>
</tr>
<tr>
<td><strong>The surfaces are no longer passed directly to the function triggering the processing of a frame, but instead they are now configured to a separate parameters object. The surfaces are configured to the parameters object with functions</strong></td>
<td></td>
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<tr>
<td><strong>Header File:</strong></td>
<td>nvmedia_ldc_sci.h</td>
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<tr>
<td><strong>API:</strong></td>
<td>NvMediaLdcSetSrcSurface()</td>
</tr>
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<td>NvMediaLdcSetDstSurface()</td>
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<td>NvMediaLdcSetPreviousSurface()</td>
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<td>NvMediaLdcSetXSobelDstSurface()</td>
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<td></td>
<td>NvMediaLdcSetDownsampledXSobelDstSurface()</td>
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<tr>
<td><strong>No separate parameter controls the XSobel working mode, but it is instead determined</strong></td>
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## Module: NvMedia LDC

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<td>Header File:</td>
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<td>API:</td>
<td>NvMediaLdcInsertPreNvSciSyncFence()</td>
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<tr>
<td>based on the surfaces configured for an operation.</td>
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<tr>
<td>If there is a need to wait for another task (for example another HW engine providing input frame to NvMedia LDC in an image processing pipeline) to complete before starting the NvMedia LDC operation, a pre-fence can be configured to the parameters object with function</td>
<td></td>
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<tr>
<td>Header File:</td>
<td>nvmedia ldc sci.h</td>
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<tr>
<td>API:</td>
<td>NvMediaLdcSetNvSciSyncObjforEOF()</td>
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<tr>
<td>If there is a need to wait for the NvMedia LDC operation to complete, an end-of-frame fence can be requested to be generated by the operation. This is done by configuring an end-of-frame NvSciSyncObj to the parameters object with function</td>
<td></td>
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<td>Header File:</td>
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<td>API:</td>
<td>NvMediaLdcGetEOFNvSciSyncFence()</td>
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<td>The end-of-frame fence can be retrieved after triggering the operation with function</td>
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### Module: NvMedia LDC

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<tr>
<td>Header File: nvmedia_ldc.h</td>
<td>The same parameters object (with same warp map, TNR3 etc. configuration) can be used for multiple frames, but the surfaces and preferences need to be configured separately for each frame.</td>
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<td>API: NvMediaLdcProcess()</td>
<td>Triggering a new NvMedia LDC operation using a parameters object is done with function</td>
</tr>
<tr>
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NvStreams API Changes

About NvStreams

NvStreams is a family of technologies related to communicating information between different interconnected hardware domains and software partitions. It provides software with the flexibility in constructing different execution pipelines between applications independent of actual system configuration and topology. NvStreams implements three specific technologies: NvSciBuf, NvSciSync, and NvSciStream.

This section summarizes the API changes that users of NvStreams can expect to see moving from NVIDIA DRIVE OS 5.2 to 6.0, keeping in mind that NVIDIA DRIVE 6.0 is still in development and functionality is subject to change.

About the NvStreams Migration

The API changes fall into a few general categories, briefly described here. The details and examples of how to make the transition, are in the following sections.

In 5.x, our approach for transmitting data through the stream was that every time data was provided on one block, it was immediately transmitted through the stream to the other blocks, where it would arrive as an event. Each type of data had its own event type, which applications needed to recognize and know how to handle. Starting with 6.0, we will organize different types of data into groups. Data will be held in the block where it is specified until the user indicates it is done with the relevant group. Then the data will be transmitted through the stream at once, resulting in a single event at each recipient. The recipient can then query and handle the data at a time of its choosing, possibly restricting its queries to a subset of the data it needs. This allows applications to organize themselves into different setup operations, and smoothly transition to streaming when setup is complete. It also allows for future expansion of NvSciStream to support optional features.

In 5.x, the producer and consumer[s] each provided a global list of sync objects to coordinate their use of the buffers. The intent was for different engines, which operated on separate buffers, to use different sync objects. Nothing in the API, however, made it clear which sync objects were relevant to the data in each buffer or engine. In 6.0, rather than specifying a global list of sync objects, endpoints will specify a single sync object for each element in the packets.

In 6.0, when IPC blocks are destroyed, they will also close associated channels. Previously, the channels were left active, and applications that were fully cleaned up would have to close them themselves. These applications must be updated or they will free the channels twice.
6.0 will introduce error codes to allow for easier debugging if anything goes wrong. Any applications that check for specific error codes will need to be updated to include the new ones.

NvStreams Examples

For most of the changed APIs, examples of how to perform the transition are provided. The examples assume a relatively simple case with two packet elements: one accessed synchronously, and one accessed asynchronously. In this code, all consumers use both elements, but comments are provided to describe how they might take advantage of the new APIs if they only access a subset. The following symbols are used to name the two elements:

```c
#define MY_ELEMENT_TYPE_BASE 0x1234
#define MY_ELEMENT_TYPE_SYNC (MY_ELEMENT_TYPE_BASE+0)
#define MY_ELEMENT_TYPE_ASYNC (MY_ELEMENT_TYPE_BASE+1)
```

For many operations, the producer and consumer code would be very similar. In these cases, to avoid duplicating large blocks of code with minor differences, only the producer version is shown, and the differences for the consumer are indicated by comments.

For simplicity, error handling has been omitted from most of the examples.

Application-specific operations to generate data to pass to NvSciStream and process data received from it is referenced by a function of the form `Application_SomeOperation();`

General Changes

Some of the new functions will require the producer application to iterate over the list of consumers. Simple applications with fixed configurations may already know the number of consumers. For more generally configurable applications, this information will now be available through the producer and pool blocks once the stream is fully connected via a new query:

```c
NvSciError
NvSciStreamBlockConsumerCountGet(
    NvSciStreamBlock const block,
    uint32_t* const numConsumers);
```

For the functions where iteration over consumers is performed, the queries will include a parameter to specify the block index. When querying information about consumers, this index should be that of the consumer. When querying information about producers, this index should always be 0.

```c
SomeFunction( ... , uint32_t const queryBlockIndex, ... );
```

Some queries on the pool block can obtain information about either the producer or consumer(s). These functions include a new parameter to specify the source of the information being queried.
typedef enum {
    NvSciStreamBlockType_Producer,
    NvSciStreamBlockType_Consumer,
    NvSciStreamBlockType_Pool
} NvSciStreamBlockType;

SomeFunction( ... , NvSciStreamBlockType const queryBlockType, ... );

Various setup operations will be broken up into key groups. Rather than transmitting every piece of data through the stream as it arrives, required and optional data for each group is gathered and sent all at once when the application indicates that it is done with the setup. This completion is signaled with a new function with the use described further in the following sections. The <completed> parameter to this function is provided for future support for dynamically modifying streams (outside of safety systems) and currently must always be true.

typedef enum { ... } NvSciStreamSetup;

NvSciError
NvSciStreamBlockSetupStatusSet(
    NvSciStreamBlock const block,
    NvSciStreamSetup const setupType,
    bool const completed);

### IPC Setup

Applications that stream between processes must call NvSciIpcResetEndpoint() on any channel endpoint they open before using it to create an NvSciStream IpcSrc or IpcDst block, regardless of whether they perform communication over the channel before passing ownership.

### Connection

Creation and connection of the stream is performed as in 5.2. After the stream is fully connected, the producer and pool can query the number of consumers, as described above.

### Example

#### Unmodified Code

```c
//
// All block creation and connection functions are as in 5.2
//
...```

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New Code

// In producer process:
//   After connection, query the number of consumers.
//   This is not necessary for simple applications where the producer
//   always knows how many consumers there will be.
uint32_t numConsumers;
NvSciStreamBlockConsumerCountGet(producerBlock, &numConsumers);

Event Handling

The event query function will no longer return an event structure. Instead, it will just return an
event type. The data previously returned in this structure will be available to query at any time
after the event is received using new functions described below. Applications receiving events
can process the event data in any order they choose. Events will also be consolidated, so a
single event will be received for groups of related data.

NvSciError
NvSciStreamBlockEventQuery(
    NvSciStreamBlock const block,
    int64_t const timeoutUsec,
    NvSciStreamEvent *const event
    NvSciStreamEventType *const eventType);

Motivation for Change: With the previous model, we required separate events for every piece
of information received at a block. Adding new features, particularly optional ones, becomes
difficult because we must add new event types, requiring application updates to recognize, and
potentially grow, the data structure, requiring recompilation of applications even if they do not
need to support the new event. The new model reduces the number of events to a smaller set
of events indicating various types of data are ready. New features simply add to the set of data
available, but older applications, which are not interested in the new data, will not have to be
modified or recompiled to accommodate changes in the data structure.

Example

This example illustrates the transition required for a generic (non-existent) array of “Foo”
data. Specific examples are provided for each real data type. For brevity, those examples omit
the outer loop and just show the case statement in the event switch.

Old Code

// Main event loop
while (<not done>) {
    NvSciStreamEvent event;
    if (NvSciError_Success !=
NvSciStreamBlockEventQuery(block, timeout, &event)) {
    switch (event.type) {
        case NvSciStreamEventType_FooCount:
            // Handle the count received in the event
            Application_FooArraySetup(event.count);
            break;
        case NvSciStreamEventType_SingleFoo:
            // Handle the individual indexed foo received in the event
            Application_FooHandler(event.index, event.fooValue);
            break;
        ...
    }
...}

New Code

// Main event loop
while (<not done>) {
    ...
    NvSciStreamEventType eventType;
    if (NvSciError_Success !=
        NvSciStreamBlockEventQuery(block, timeout, &eventType)) {
        switch (eventType) {
            ...
            case NvSciStreamEventType_AllFoos:
                // Query and handle the count
                uint32_t fooCount;
                NvSciStreamBlockFooCountGet(block, &fooCount);
                Application_FooArraySetup(fooCount);
                // Query and handle each indexed value
                for (uint32_t j; j<fooCount; j++) {
                    FooType fooValue;
                    NvSciStreamBlockFooValueGet(block, j, &fooValue);
                    Application_FooHandler(j, fooValue);
                }
                break;
            ...
        }
    ...
}...
Error Events

If an error event [NvSciStreamEventType_Error] occurs on any block, the associated error value can be queried with a new function:

```c
NvSciError
NvSciStreamBlockErrorGet(
    NvSciStreamBlock const block,
    NvSciError* const status);
```

Element Support

Specifying Element Support

There will be a minor change in how the producer and consumer(s) specify the types of packet elements they support, and how the pool specifies the final element layout. Instead of specifying the number of elements up front and then each element by index, the elements will be passed without an index. After specifying all of the elements, the application will indicate it is done with the element setup by calling NvSciStreamBlockSetupStatusSet() with a value of NvSciStreamSetup_ElementExport. The indices and count will be determined automatically by NvSciStream.

**Motivation for Change:** Elimination of the count and index provides a more natural means of specifying the support, particularly for simple applications that only provide a single element. The addition of the completion signal after the elements are specified also allows for future features that specify optional support along with the list of elements.

The synchronization mode parameter will also be eliminated from the element specification. Instead, this will be covered by the specification of synchronization object attributes, described below.

**Motivation for Change:** The original interfaces had redundant and potentially conflicting methods for specifying whether data is written and read synchronously or asynchronously. We are consolidating on a single method to eliminate confusion.

```c
NvSciError
NvSciStreamBlockPacketElementCount(
    NvSciStreamBlock const block,
    uint32_t const count);
```

```c
NvSciError
NvSciStreamBlockPacketAttr(
    NvSciStreamBlockElementAttrSet(
        NvSciStreamBlock const block,
        uint32_t const index,
        uint32_t const userType,
        NvSciStreamElementMode const syncMode,
        NvSciBufAttrList const bufAttrList);
```
Producer (and Consumer) Example

Old Code

```c
// Set up the attributes for each buffer type we generate
// (For consumers, obtain read attributes instead of write)
NvSciBufAttrList elemAttrs[2];
Application_ElementWriteAttrs(elemAttrs);
// Inform NvSciStream there are 2 elements and send each of them
NvSciStreamBlockPacketElementCount(block, 2);
NvSciStreamBlockPacketAttr(block, 0, MY_ELEMENT_TYPE_SYNC,
    NvSciStreamElementMode_Immediate,
    elemAttrs[0]);
NvSciStreamBlockPacketAttr(block, 1, MY_ELEMENT_TYPE_ASYNC,
    NvSciStreamElementMode_Asynchronous,
    elemAttrs[1]);
```

New Code

```c
// Set up the attributes for each buffer type we generate
// (For consumers, obtain read attributes instead of write)
NvSciBufAttrList elemAttrs[2];
Application_ElementWriteAttrs(elemAttrs);
// Inform NvSciStream of each element
// (If a consumer doesn’t need one of these, it just skips it)
NvSciStreamBlockElementAttrSet(block, MY_ELEMENT_TYPE_SYNC,
    elemAttrs[0]);
NvSciStreamBlockElementAttrSet(block, MY_ELEMENT_TYPE_ASYNC,
    elemAttrs[1]);
// Inform NvSciStream that element specification is done
NvSciStreamBlockSetupStatusSet(block,
    NvSciStreamSetup_ElementExport,
    true);
```

Pool Example

Refer to the next section for the combined receive and send example.

Receiving Element Support

Previously, the number of elements and individual element types arrived as separate events on each block. Now, the pool, producer, and consumer will each receive a single NvSciStreamEvent_Elements event. The pool will receive this event after the producer and all consumers finish specifying their element support. After the pool has finished specifying the final packet element layout, the producer and consumers receive this event.
After receiving this event, the application queries the element information using new functions instead of obtaining it as data in the event structure. The pool should use a
<queryBlockType> of NvSciStreamBlockType_Producer or
NvSciStreamBlockType_Consumer to get the information from the producer or consumers, respectively. The producer and consumer should use a <queryBlockType> of
NvSciStreamBlockType_Pool.

When querying the elements, consumers can choose not to use all of them. A consumer can inform NvSciStream that an element will not be used by calling
NvSciStreamBlockElementUsageSet() with <used> set to false. This will allow
NvSciStream to optimize by not sharing the relevant buffers with the consumer. This function can be called with <used> set to true, but this is the default, and the call is not necessary. Therefore, most existing applications will not need to add this call.

After querying element information and (for the consumer) indicating which elements they will support, the producer and consumer(s) must call the new
NvSciStreamSetupStatusSet() function with a value of
NvSciStreamSetup_ElementImport. This allows them to begin receiving packets from the pool.

typedef enum {
    ...
        NvSciStreamEventType_PacketElementCountProducer,
        NvSciStreamEventType_PacketElementCountConsumer,
        NvSciStreamEventType_PacketElementCount,
        NvSciStreamEventType_PacketAttrProducer,
        NvSciStreamEventType_PacketAttrConsumer,
        NvSciStreamEventType_PacketAttr,
        NvSciStreamEventType_Elements
    ...
} NvSciStreamEventType;

NvSciError
NvSciStreamBlockElementCountGet(
    NvSciStreamBlock const block,
    NvSciStreamBlockType const queryBlockType,
    uint32_t* const numElements);

NvSciError
NvSciStreamBlockElementAttrGet(
    NvSciStreamBlock const block,
    NvSciStreamBlockType const queryBlockType,
    uint32_t const elemIndex,
    uint32_t* const userType,
    NvSciBufAttrList* const bufAttrList);

NvSciError
NvSciStreamBlockElementUsageSet(
Pool Example

For simplicity, this code assumes that the producer and consumer express support for both element types. A more generic pool application would use the received counts, check the list of support indicated, and decide the subset of types to use for the final packet layout.

Old Pool Code

```c
uint32_t prodElemFound = 0, consElemFound = 0;
NvSciBufAttrList supportElemAttr[2][2], packetElemAttr[2];
bool elemSetupDone = false;
...
case NvSciStreamEventType_PacketElementCountProducer:
case NvSciStreamEventType_PacketElementCountConsumer:
    // For this simple example, expect count is always 2
    assert(event.count == 2);
    break;
case NvSciStreamEventType_PacketAttrProducer:
    // Save incoming producer attribute list
    myIndex = event.userData - MY_ELEMENT_TYPE_BASE;
    supportElemAttr[myIndex][0] = event.bufAttrList;
    prodElemFound++;
    break;
case NvSciStreamEventType_PacketAttrConsumer:
    // Save incoming consumer attribute list
    myIndex = event.userData - MY_ELEMENT_TYPE_BASE;
    supportElemAttr[myIndex][1] = event.bufAttrList;
    consElemFound++;
    break;
...
// After event-handling switch
...
// When all expected element attributes are received, set up the
// final packet layout
if (!elemSetupDone && (prodElemFound == 2) && (consElemFound == 2)) {
    // Combine producer and consumer attributes
    for (uint32_t j=0; j<3; ++j) {
        // Reconcile attributes
        NvSciBufAttrList conflicts;
        NvSciBufAttrListReconcile(supportElemAttr[j], 2,
                                &packetElemAttr[j], &conflicts);
    }
    // Specify final layout
    NvSciStreamBlockPacketElementCount(pool, 2);
```
NvSciStreamPacketAttr(pool, 0, MY_ELEMENT_TYPE_SYNC,
   NvSciStreamElementMode_Immediate,
   packetElemAttr[0]);
NvSciStreamPacketAttr(pool, 1, MY_ELEMENT_TYPE_ASYNC,
   NvSciStreamElementMode_Asynchronous,
   packetElemAttr[1]);
// Mark setup done so we don’t do this again
elemSetupDone = true;

New Pool Code

NvSciBufAttrList packetElemAttr[2];
...
// Handle all incoming element descriptions at once
case NvSciStreamEventType_Elements:
   // For this simple example, the counts are known to always be 2,
   // so the queries could be skipped. They are done here solely to
   // illustrate how to do them.
   uint32_t elemCount;
   NvSciStreamPacketElementCountGet(pool,
      NvSciStreamPacket_Type_Producer,
      &elemCount);
   assert(elemCount == 2);
   NvSciStreamPacketElementCountGet(pool,
      NvSciStreamPacket_Type_Consumer,
      &elemCount);
   assert(elemCount == 2);

   // Query the buffer attribute lists from both endpoints
   NvSciBufAttrList supportElemAttr[2][2];
   for (uint32_t j=0; j<2; ++j) {
      uint32_t userType;
      NvSciBufAttrList attr;
      NvSciStreamPacketElementAttrGet(pool,
         NvSciStreamPacket_Type_Producer,
         j, &userType, &attr);
      supportElemAttr[userType-MY_ELEMENT_TYPE_BASE][0] = attr;
      NvSciStreamPacketElementAttrGet(pool,
         NvSciStreamPacket_Type_Consumer,
         j, &userType, &attr);
      supportElemAttr[userType-MY_ELEMENT_TYPE_BASE][1] = attr;
   }
   // Inform NvSciStream that element import is done
   NvSciStreamPacketSetupStatusSet(pool,
      NvSciStreamSetup_ElementImport,
      true);

   // Combine and send producer and consumer attributes
   for (uint32_t j=0; j<2; ++j) {
Producer and Consumer Example

Note: In this and all subsequent examples, we assume that the pool has specified the elements in an expected order, with the synchronous element first and the asynchronous one second. In a more general application, where the set of elements isn’t fixed, the producer and consumer need to keep track of the indices for each type for use when querying sync and buffer data.

Old Producer/Consumer Code

```c
NvSciBufAttrList packetElemAttr[2];
...

case NvSciStreamEventType_PacketElementCount:
    // For this simple example, expect count is always 2
    assert(event.count == 2);
    break;

case NvSciStreamEventType_PacketAttr:
    // Save the element info
    myIndex = event.userData - MY_ELEMENT_TYPE_BASE;
    assert(myIndex == event.index);
    packetElemAttr[myIndex] = event.bufAttrList;
    break;
...
```

New Producer/Consumer Code

```c
NvSciBufAttrList packetElemAttr[2];
...

case NvSciStreamEventType_Elements:
    // For this simple example, the count is known to always be 2,
    // so the query could be skipped. It is done here solely to
    // illustrate how to do it.
    uint32_t elemCount;
    NvSciStreamBlockElementCountGet(block,
        NvSciStreamElementType_Pool,
        &elemCount);
    if (elemCount == 2)
        packetElemAttr[0] = ...
```
assert(elemCount == 2);

// Record the element info
for (uint32_t j=0; j<2; ++j) {
    uint32_t userType;
    NvSciBufAttrList attr;
    NvSciStreamBlockElementAttrGet(block,
        NvSciStreamBlockType_Pool,
        j, &userType, &attr);
    // The consumer can skip any elements which it doesn’t use by
    // adding the following call. This will not be needed in most
    // existing applications, and is intentionally commented out here.
    // NvSciStreamBlockElementUsageSet(block, j, false);
    myIndex = userType - MY_ELEMENT_TYPE_BASE;
    assert(myIndex == j);
    packetElemAttr[myIndex] = attr;
}

// Inform NvSciStream that element import is done
NvSciStreamBlockSetupStatusSet(block,
    NvSciStreamSetup_ElementImport,
    true); break;

Element Sync Attributes

Instead of a list of global sync objects, sync objects will be specified on a per element basis. (It will still be possible to use the same sync object with multiple elements.) Because of this, providing the sync attributes occurs after the endpoints receive the packet layout information. Producers are required to generate data for all elements.

Motivation for Change: Having a list of multiple sync objects was intended to support the case where the contents of some buffers were written or read by different engines operating independently, each signaling their fence when they are done. However, because the sync objects were defined globally, there was nothing to indicate for which buffers each one was relevant. The other endpoint[s] would have to wait for all the fences, even if only one of them pertained to the data they cared about. Per-element sync objects allow the original intention to be achieved.

The NvSciStreamBlockSyncRequirements() function will be replaced with a new function that provides the endpoint’s waiter requirements for that element. The <synchronousOnly> parameter is eliminated. If the endpoint requires the data to be generated synchronously, it can pass NULL for the attribute list, or it can omit the call and NULL will be assumed.

If the consumer will not use an element, it is not necessary for it to provide a corresponding waiter attribute list, but it is important that it informs NvSciStream that it will not use the element, as described in the previous section. Otherwise, the producer will be told that sync
objects are not supported for the element even if the consumers that use it provide attribute lists.

```c
NvSciError
NvSciStreamBlockSyncRequirements(
NvSciStreamBlockElementWaiterAttrSet(
    NvSciStreamBlock const block,
    uint32_t const elemIndex,
    bool const synchronousOnly,
    NvSciSyncAttrList const waitSyncAttrList);
```

**Example**

This example just takes the sync attributes previously sent globally and associates them with the single element used asynchronously. An application that uses more than one element generated by the same engine can pass the same attribute list for each element, while one that uses elements generated by different engines can pass separate attribute lists for each element.

**Old Code**

```c
// Obtain waiter attributes for engine used for asynchronous element
NvSciSyncAttrList waiterAttr;
Application_GetEngineWaitAttrs(&waiterAttr);
// Send attributes
NvSciStreamBlockSyncRequirements(block, false, waiterAttr);
```

**New Code**

In practice, this code would probably be merged with that from the previous section, where the list of packet elements is queried. An application would specify which elements it uses, and the sync attributes for them as it receives the elements.

```c
// Note that if a consumer doesn’t use one of the elements, it would
// skip the call that indicates support for it

// Indicate that the synchronous element will be used without any
// sync object by passing NULL for the attributes
// This call could be omitted since NULL is the default
NvSciStreamBlockElementWaiterAttrSet(block, 0, NULL);

// Obtain waiter attributes for engine used for asynchronous element
NvSciSyncAttrList waiterAttr;
Application_GetEngineWaitAttrs(&waiterAttr);
// Indicate that the element will be used and provide the sync attrs
NvSciStreamBlockElementWaiterAttrSet(block, 1, waiterAttr);

// Inform NvSciStream that waiter attribute export is done
```
NvSciStreamBlockSetupStatusSet(block,
    NvSciStreamSetup_WaiterAttrExport,
    true);

## Packets

### Specifying packets

After calling `NvSciStreamBlockSetupStatusSet()` to indicate it is done exporting the element layout, the pool application can begin to define the packets. The functions to create packets and insert buffers into them remain the same as in 5.2. However, there is a new function which must be called to indicate a packet’s specification is complete and send it to the rest of the stream. If the application previously waited for packet acceptance before sending the buffers or for buffer acceptance before sending the next buffer, it should no longer do so. The entire packet will now be sent at once.

```c
NvSciError
NvSciStreamPoolPacketComplete(
    NvSciStreamBlock const pool,
    NvSciStreamPacket const handle);
```

As described below, the producer and consumer[s] will similarly accept or reject a packet and all its buffers at once. When the producer and all consumers have provided status for a given packet, the pool receives a single event, rather than separate events, for the packet and each buffer. To determine the status, there are two new queries. The first quickly checks whether the packet was accepted or rejected. If status has not yet been received for a packet, an error that indicates this will be returned. The second retrieves the status values sent by each endpoint, which can be used in the event the packet was rejected to learn more information.

**Motivation for Change:** Consolidating the events to send packets and receive status simplifies application organization.

```c
typedef enum {
    ...
    NvSciStreamEventType_PacketStatusProducer,
    NvSciStreamEventType_PacketStatusConsumer,
    NvSciStreamEventType_ElementStatusProducer,
    NvSciStreamEventType_ElementStatusConsumer,
    NvSciStreamEventType_PacketStatus,
    ...
};
```

```c
NvSciError
NvSciStreamPoolPacketStatusAcceptGet(
    NvSciStreamBlock const pool,
    NvSciStreamPacket const handle,
    bool* const accepted);
```
NvSciError
NvSciStreamPoolPacketStatusValueGet(
    NvSciStreamBlock const pool,
    NvSciStreamPacket const handle,
    NvSciStreamBlockType const queryBlockType,
    uint32_t const queryBlockIndex,
    NvSciError* const status);

After sending all packets, the application should indicate that packet setup is complete by calling the new \texttt{NvSciStreamSetupStatusSet()} function with a value of \texttt{NvSciStreamSetup_PacketExport}. After receiving the status for all packets, the application should call this function with a value of \texttt{NvSciStreamSetup_PacketImport}. An application may wait for status to be returned before indicating that packet export is finished, in case any of the packets was rejected and it wants to adjust something. This is left to the developers to decide.

Example

Old Code

\begin{verbatim}
NvSciBufObj buffer[] = ...

for (uint32_t p=0; p<packetCount; ++p) {
    NvSciStreamPacket packet;
    NvSciStreamPoolPacketCreate(pool, p+1, &packet);
    for (uint32_t b=0; b<bufferCount; ++b) {
        NvSciStreamPacketInsertBuffer(pool, packet, b, buffer[p][b]);
    }
}
bool packetFailure = false;

... case NvSciStreamEventType_PacketStatusProducer:
    if (event.error != NvSciError_Success) {
        printf("Producer rejected packet %x with error %x\n", 
            event.packetCookie, event.error);
        packetFailure = true;
    }
    break;

... case NvSciStreamEventType_ElementStatusProducer:
    if (event.error != NvSciError_Success) {
        printf("Producer rejected buffer %d of packet %x " 
            "with error %x\n", 
            event.index, event.packetCookie, event.error);
        packetFailure = true;
    }
    break;

... case NvSciStreamEventType_PacketStatusConsumer:
    if (event.error != NvSciError_Success) {
        printf("A consumer rejected packet %x with error %x\n", 
            event.packetCookie, event.error);
        packetFailure = true;
    }
    break;

... case NvSciStreamEventType_BufferStatusProducer:
    if (event.error != NvSciError_Success) {
        printf("Producer rejected buffer %d of packet %x " 
            "with error %x\n", 
            event.index, event.packetCookie, event.error);
    }
    break;

... case NvSciStreamEventType_BufferStatusConsumer:
    if (event.error != NvSciError_Success) {
        printf("A consumer rejected buffer %d of packet %x " 
            "with error %x\n", 
            event.index, event.packetCookie, event.error);
    }
    break;

... case NvSciStreamEventType_BufferStatusConsumer:
    if (event.error != NvSciError_Success) {
        printf("A consumer rejected buffer %d of packet %x " 
            "with error %x\n", 
            event.index, event.packetCookie, event.error);
    }
    break;

... case NvSciStreamEventType_BufferStatusConsumer:
    if (event.error != NvSciError_Success) {
        printf("A consumer rejected buffer %d of packet %x " 
            "with error %x\n", 
            event.index, event.packetCookie, event.error);
    }
    break;

...
\end{verbatim}
event.packetCookie, event.error);
    packetFailure = true;
} break;
case NvSciStreamEventType_ElementStatusConsumer:
    if (event.error != NvSciError_Success) {
        printf("A consumer rejected buffer %d of packet %x "
            "with error %x\n",
            event.index, event.packetCookie, event.error);
        packetFailure = true;
    } break;
...

New Code

There are multiple ways the status handling could be organized. In particular, waiting for
status could be interleaved with sending the packets instead. This is just one example that
illustrates all the new functions.

NvSciBufObj buffer[][] = ...
...
for (uint32_t p=0; p<packetCount; ++p) {
    NvSciStreamPacket packet;
    NvSciStreamPoolPacketCreate(pool, p+1, &packet);
    for (uint32_t b=0; b<bufferCount; ++b) {
        NvSciStreamPacketInsertBuffer(pool, packet, b, buffer[p][b]);
    }
    NvSciStreamPacketComplete(pool, packet);
}

NvSciStreamBlockSetupStatusSet(pool,
    NvSciStreamSetup_PacketExport,
    true);

bool packetFailure = false;
uint32_t packetsReady = 0;
...

NvSciStreamEventType_PacketStatus:
    // Wait until status has arrived for all packets
    if (++packetsReady < packetCount) {
        break;
    }

    // Check each packet
    for (uint32_t p=0; p<packetCount; ++p) {
        // Check packet acceptance
        bool accept;
        NvSciStreamPoolPacketStatusAcceptGet(pool, packet[p], &accept);
if (accept) {
    continue;
}
packetFailure = true;

// On rejection, query and report details
NvError status;
NvSciStreamPoolPacketStatusValueGet(
    pool, packet[p], NvSciStreamBlockTypeProducer, 0,
    &status);
if (status != NvSciError_Success) {
    printf("Producer rejected packet %x with error %x\n", packet[p], status);
    for (uint32_t c=0; c<numConsumers; ++c) {
        NvSciStreamPoolPacketStatusValueGet(
            pool, packet[p], NvSciStreamBlockTypeConsumer, c,
            &status);
        if (status != NvSciError_Success) {
            printf("Consumer %d rejected packet %x ",
                "with error %x\n" ,
                c, packet[p], status);
        }
    }
}

// Inform NvSciStream that packet status import is done
NvSciStreamBlockSetupStatusSet(pool,
    NvSciStreamSetup_PacketImport, true);
break;

Receiving Packets

Rather than receiving separate events for creating a packet and each of its buffers, the producer and consumer(s) will receive a NvSciStreamEventType_PacketCreate event for each packet. They call a new function to dequeue the handle of the new packet and then another new function to obtain the buffers for any elements in the packet that they use.

typedef enum {
    ...
    NvSciStreamEventType_PacketCreate,
    NvSciStreamEventType_PacketElement,
    ...
};

NvSciError
NvSciStreamBlockPacketNewHandleGet(
    NvSciStreamBlock const block,
NvSciStreamPacket* const handle);

NvSciError
NvSciStreamBlockPacketBufferGet(
    NvSciStreamBlock const block,
    NvSciStreamPacket const handle,
    uint32_t elemIndex),
    NvSciBufObj* const bufObj);

After checking whether it can map in all the buffers for a given packet, the endpoint should
signal status back to the pool. Rather than sending separate status for the packet and each
buffer, only a single function is called.

NvSciError
NvSciStreamBlockPacketAccept(
NvSciStreamBlockPacketStatusSet(
    NvSciStreamBlock const block,
    NvSciStreamPacket const handle,
    NvSciStreamCookie const cookie,
    NvSciError const status);

NvSciError
NvSciStreamBlockElementAccept(
    NvSciStreamBlock const block,
    NvSciStreamPacket const handle,
    uint32_t const index,
    NvSciError const err);

After the pool has indicated that it is finished exporting all the packets, the endpoints will
receive a new NvSciStreamEventType_PacketsComplete event. They can finish up any
setup related to packet resources and should then indicate they are done importing the
packets by calling the NvSciStreamBlockSetupStatusSet() function with a value of

If a packet is deleted by the pool, when the producer or consumer receives the
NvSciStreamEventType_PacketDelete event, it can determine the identify of the deleted
packet by calling a function which retrieves the cookie of a packet pending deletion. After this
function is called, the handle of the returned packet becomes invalid for subsequent function
calls.

NvSciError
NvSciStreamBlockPacketOldCookieGet(
    NvSciStreamBlock const block,
    NvSciStreamCookie* const cookie);

Example

Old Code

...
case NvSciStreamEventType_PacketCreate:
    // Create new application-specific data structure for packet
    MyPacket* cookie = Application_CreateNewPacket(event.packetHandle);
    // Inform pool of success
    NvSciStreamBlockPacketAccept(
        block, cookie->packetHandle, cookie, NvSciError_Success);
    break;

case NvSciStreamEventType_PacketElement:
    // Retrieve application’s data structure for the packet
    MyPacket* cookie = (MyPacket*)event.cookieHandle;
    // Map buffer into application
    Application_MapPacketBuffer(cookie, event.index, event.bufObj);
    // Inform pool of success
    NvSciStreamBlockElementAccept(
        block, cookie->packetHandle, event.index, NvSciError_Success);
    break;

...
Sync Objects

Specifying Sync Objects

After indicating their waiter sync attributes for all elements they support, by calling
NvSciStreamBlockElementWaiterAttrSet(), the producer and consumer(s) must call the
new NvSciStreamBlockSetupStatusSet() function with a value of
NvSciStreamSetup_WaiterAttrExport. This sends the sync attributes to the opposing
endpoint(s), each receiving a single NvSciStreamEventType_WaiterAttr event.

The endpoints should query the waiter sync attributes for each element they support using a
new function. [As in 5.2, if there are multiple consumers, their waiter sync attribute lists will
be combined before they arrive at the producer, but now there will be a separate list for each
element.] If NULL is received for any attribute list, it means one or more of the opposing
endpoints do not support sync objects for that element, and the data should be written or read
synchronously.

typedef enum {
    ...
    NvSciStreamEventType_SyncAttr,
    NvSciStreamEventType_WaiterAttr,
    ...
};

NvSciError
NvSciStreamBlockElementWaiterAttrGet(
    NvSciStreamBlock const block,
    uint32_t const elemIndex,
    NvSciSyncAttrList* const waitSyncAttrList);

For each element, the endpoints should combine and reconcile the received waiter attribute
lists with their signaler attribute lists, and where appropriate, use them to create a sync object
that they will signal. This occurs in 5.2, except there now one sync object per element. The
function for sending global sync objects is replaced with a per-element function. It is no longer
necessary to send the number of sync objects. If this function is not called for an element, the
sync object is assumed to be NULL.

NvSciError
NvSciStreamBlockSyncObjCount(
    NvSciStreamBlock const block,
    uint32_t const count);

NvSciError
NvSciStreamBlockSyncObject(
    NvSciStreamBlockElementSignalObjSet(
        NvSciStreamBlock const block,
        uint32_t const index,
        uint32_t const elemIndex,
NvSciSyncObj const signalSyncObj;

After receiving all the sync attribute lists they care about, the endpoints should call the new NvSciStreamBlockSetupStatusSet() function with a value of NvSciStreamSetup_WaiterAttrImport. After specifying all their sync objects, they should call it with a value of NvSciStreamSetup_SignalObjExport.

Example

Old Code

```c
... case NvSciStreamEventType_SyncAttr:
    NvSciSyncAttrList inputAttrs[2], combined, conflicts;
    // Obtain signaler attributes for engine
    Application_GetEngineSignalAttrs(&inputAttrs[0]);
    // Combine and reconcile with incoming waiter attributes
    inputAttrs[1] = event.syncAttrList;
    NvSciSyncAttrListReconcile(inputAttrs, 2, &combined, &conflicts);
    // Create new sync object
    NvSciSyncObj syncObj;
    NvSciSyncObjAlloc(combined, &syncObj);
    // Pass sync object to other end of stream
    NvSciStreamBlockSyncObjCount(block, 1);
    NvSciStreamBlockSyncObject(block, 0, syncObj);
...```

New Code

```c
... case NvSciStreamEventType_WaiterAttr:
    NvSciSyncAttrList inputAttrs[2], combined, conflicts;
    // Retrieve waiter attribute for asynchronous element
    NvSciStreamBlockElementWaiterAttrGet(block, 1, &inputAttrs[1]);
    // Inform NvSciStream that sync attribute import is done
    NvSciStreamBlockSetupStatusSet(block, 
        NvSciStreamSetup_WaiterAttrImport, 
        true);
    // Obtain signaler attributes for engine
    Application_GetEngineSignalAttrs(&inputAttrs[0]);
    // Combine and reconcile
    NvSciSyncAttrListReconcile(inputAttrs, 2, &combined, &conflicts);
    // Create new sync object
    NvSciSyncObj syncObj;
    NvSciSyncObjAlloc(combined, &syncObj);
    // Associate sync object with asynchronous element
    NvSciStreamBlockElementSignalObjSet(block, 1, syncObj);
    // Inform NvSciStream that sync object export is done
    NvSciStreamBlockSetupStatusSet(block, 
```
Receiving Sync Objects

When the producer finishes specifying all its sync objects, the consumer(s) will receive a single NvSciStreamEventType_SignalObj event. Similarly, when all consumers have specified their sync objects, the producer will receive a single NvSciStreamEventType_SignalObj event.

The endpoints can then query these sync objects and map them into their engines. The producer will receive a separate sync object (or NULL) for each consumer.

```c
typedef enum {
    ...
    NvSciStreamEventType_SyncCount,
    NvSciStreamEventType_SyncDesc,
    NvSciStreamEventType_SignalObj,
    ...
};

NvSciError NvSciStreamBlockElementSignalObjGet(
    NvSciStreamBlock const block,
    uint32_t const queryBlockIndex,
    uint32_t const elemIndex,
    NvSciSyncObj* const signalSyncObj);
```

After receiving and mapping all the sync objects they care about, the endpoints should call the new NvSciStreamBlockSetupStatusSet() function with a value of NvSciStreamSetup_SignalObjImport.

Example

Old Code

```c
...
    case NvSciStreamEventType_SyncCount:
        Application_InitializeSyncList(event.count);
        break;
    case NvSciStreamEventType_SyncDesc:
        Application_MapWaiterSync(event.index, event.syncObj);
        break;
...
```
New Consumer Code

```c
...  
  case NvSciStreamEventType_SignalObj:  
    Application_InitializeSyncList(1);  
    NvSciSyncObj syncObj;  
    NvSciStreamBlockElementSignalObjGet(block, 0, 1 syncObj);  
    Application_MapWaiterSync(0, syncObj);  
    break;  
...```

New Producer Code

```c
...  
  case NvSciStreamEventType_SignalObj:  
    Application_InitializeSyncList(numConsumers);  
    for (uint32_t c=0; c<numConsumers; ++c) {  
      NvSciSyncObj syncObj;  
      NvSciStreamBlockElementSignalObjGet(block, c, 1 syncObj);  
      Application_MapWaiterSync(c, syncObj);  
    }  
    break;  
...```

Phase Change

When the pool indicates it exported all the packets, and the endpoints indicate that they are done importing the packets and importing and exporting the sync objects, all blocks will receive a new event in the stream. This indicates that all necessary setup steps are complete. Applications that divide their event handling into separate initialization and runtime phases can use this to trigger the transition.

```c
typedef enum {
  ...  
  NvSciStreamEventType_SetupComplete,
  ...  
};```

Example

Previously, there was no specific mechanism to signal this to the application. It would not know to transition until the first NvSciStreamEventType_PacketReady event arrived.

New Code

```c
...  
  case NvSciStreamEventType_SetupComplete:  
    Application_PhaseTransition();  
...```
Streaming Functions

The producer will continue to obtain packets to fill with `NvSciStreamProducerPacketGet()` and present them with `NvSciStreamProducerPacketPresent()`. Consumers will continue to obtain packets to process with `NvSciStreamConsumerPacketAcquire()` and return them for reuse with `NvSciStreamConsumerPacketRelease()`. However, the fence array parameters will be eliminated from these functions. Instead, the pre-fences associated with a packet can be queried one at a time after obtaining it, and post-fences can be specified one at a time before presenting it, using new functions.

```c
NvSciError
NvSciStreamProducerPacketGet(
    NvSciStreamBlock const producer,
    NvSciStreamCookie *const cookie,
    NvSciSyncFence *const prefences);

NvSciError
NvSciStreamProducerPacketPresent(
    NvSciStreamBlock const producer,
    NvSciStreamPacket const handle,
    NvSciSyncFence const *const postfences);

NvSciError
NvSciStreamConsumerPacketAcquire(
    NvSciStreamBlock const consumer,
    NvSciStreamCookie *const cookie,
    NvSciSyncFence *const prefences);

NvSciError
NvSciStreamConsumerPacketRelease(
    NvSciStreamBlock const consumer,
    NvSciStreamPacket const handle,
    NvSciSyncFence const *const postfences);

NvSciError
NvSciStreamBlockPacketFenceSet(
    NvSciStreamBlock const block,
    NvSciStreamPacket const handle,
    uint32_t const elemIndex,
    NvSciSyncFence const *const postfence);

NvSciError
NvSciStreamBlockPacketFenceGet(
    NvSciStreamBlock const block,
    NvSciStreamPacket const handle,
    uint32_t const queryBlockIndex,
    NvSciSyncFence *const postfence);
```
Example

Only the producer is shown here. The consumer changes are analogous, except that there is only one incoming fence from the producer, so no loop is required.

Old Producer Code

```c
...
case NvSciStreamEventType_PacketReady:
    MyPacket* cookie;
    NvSciSyncFence prefences[N], postfence;
    // Retrieve the packet to use
    NvSciStreamProducerPacketGet(
        producer, (NvSciStreamCookie*)&cookie, prefences);
    // Synchronize and generate the data
    for (uint32_t j=0; j<syncCount; ++j) {
        Application_EngineWaitForFence(prefences[j]);
    }
    Application_EngineGenerateData(cookie);
    Application_EngineSignalFence(&postfence);
    // Insert the finished packet in the stream
    NvSciStreamProducerPacketPresent(
        producer, cookie->packetHandle, &postfence);
break;
...
```

New Producer Code

```c
...
case NvSciStreamEventType_PacketReady:
    MyPacket* cookie;
    NvSciSyncFence fence;
    // Retrieve the packet to use
    NvSciStreamProducerPacketGet(
        producer, (NvSciStreamCookie*)&cookie);
    // Retrieve and wait for each consumer fence
    for (uint32_t j=0; j<numConsumer; ++j) {
        NvSciStreamBlockPacketFenceGet(
            producer, cookie->packetHandle, j, 1, &fence);
        Application_EngineWaitForFence(fence);
    }
    // Generate new data and signal fence
    Application_EngineGenerateData(cookie);
    Application_EngineSignalFence(&fence);
    // Update postfence for packet
```
NvSciStreamBlockPacketFenceSet(Producer, cookie->packetHandle, 1, &fence);
// Insert the finished packet into the stream
NvSciStreamProducerPacketPresent(producer, cookie->packetHandle);
break;

NvScilpc API Changes

Summary of the NvScilpc API Timeline

Release 6.0.2.0
- Safe APIs in the Deprecated APIs section are not available
- Migration is not required
- Affected platform: Linux and QNX

Release 6.0.3.0
- Both non-safe APIs and safe APIs in the Deprecated APIs section are available on standard and safety builds
- APIs in the Modified APIs section are available on standard and safety builds
- Migration to safe APIs is required
- Affected platform: Linux and QNX

Release 6.0.4.0
- Non-safe APIs are deprecated on standard and safety builds
- Ensure code doesn’t use non-safe APIs in the Deprecated APIs section
- Affected platform: Linux and QNX

Release 6.0.5.0
- Stakeholders must ensure the Safety build does not use non-safe APIs identified in 6.0.4.0
- Affected platform: Linux and QNX

The NvScilpc Library

The NvScilpc library provides interfaces for any two entities in a system to communicate with each other irrespective of where they are placed. Entities can be in:
Different threads in the same process
- The same process
- Different processes in the same VM
- Different VMs on the same SoC

Each of these different boundaries will be abstracted by a library providing unified communication [Read/Write] APIs to entities. The communication consists of two bi-directional send/receive queues.

Differences Between DRIVE OS 5.2 and 6.0

In 6.0.3.0,
- New safe APIs replace APIs from 5.2 to handle error detection and propagation paths more effectively. The move to safe APIs requires changes in the function signature, which breaks existing code unless the migration does not occur when the API is released.
- To support detection of write queue emptiness, a legacy API [NvSciIpcGetEvent] is updated, which helps producers know when to fill in the buffer.

In 6.0.4.0,
- Interrupt unmasking can occur even when the interrupt is not masked. New APIs enhance the interrupt unmasking flow so that no interrupt, which is not masked, is unmasked again. This new flow enhances performance.
- Private pulse pool, introduced by QNX, prevents unprivileged processes from making interference-like DDoS attacks. New APIs support creating the channel with private pulse pool and inspecting which events are turned into rogue ones.
- An event handler is supported in the event notifier of NvSciEventService and calls WaitForXXX() APIs when the event arrives.
- Version checking APIs check library compatibility.

Deprecated and Modified APIs

These APIs are replaced with safe versions, which strengthen error detection and the path to the returning error.

Deprecated:

```c
void NvSciIpcCloseEndpoint(NvSciIpcEndpoint handle)
```

Safe version:

```c
NvSciError NvSciIpcCloseEndpointSafe(NvSciIpcEndpoint handle, bool clear)
```
Improved safety points:

- The safe API checks bad parameters and returns an error if detected.
- The safe API has an option parameter to clear tx queue buffer for security.

Porting guideline:

```c
NvSciError err;
bool clear;

clear = true; /* if tx buffer in queue wants to be cleared for security reason */
err = NvSciIpcCloseEndpointSafe(handle, clear);
/* add codes to handle err here */
```

Platform: QNX and Linux

Released: 6.0.3.0

Deprecated:

```c
void NvSciIpcResetEndpoint(NvSciIpcEndpoint handle)
```

Safe version:

```c
NvSciError NvSciIpcResetEndpointSafe(NvSciIpcEndpoint handle)
```

Improved safety points:

- The safe API checks for bad parameters and returns an error if detected.

Porting guideline:

```c
NvSciError err;

err = NvSciIpcResetEndpointSafe(handle);
/* add codes to handle err here */
```

Platform: QNX and Linux

Released: 6.0.3.0

Deprecated:

```c
NvSciError NvSciIpcRead(NvSciIpcEndpoint handle, void *buf, size_t size, int32_t *bytes)
```

Safe version:

```c
NvSciError NvSciIpcReadSafe(NvSciIpcEndpoint handle, void *buf, uint32_t size, uint32_t *bytes)
```

Improved safety points:

- The safe API limits the boundary of size and bytes parameter to unsigned integer 32bit

Porting guideline:
NvSciError err;
uint32_t size;
uint32_t bytes;

err = NvSciIpcReadSafe(handle, buf, size, bytes);
/* add codes to handle err here */

Platform: QNX and Linux
Released: 6.0.3.0
Deprecated:

NvSciError NvSciIpcWrite(NvSciIpcEndpoint handle, const void *buf, size_t size, int32_t *bytes)

Safe version:
NvSciError NvSciIpcWriteSafe(NvSciIpcEndpoint handle, const void *buf, uint32_t size, uint32_t *bytes)

Improved safety points:
The safe API limits the boundary of size and bytes parameter to unsigned integer 32bit.

Porting guideline:

NvSciError err;
uint32_t size;
uint32_t bytes;

err = NvSciIpcWriteSafe(handle, buf, size, bytes);
/* add codes to handle err here */

Platform: QNX and Linux
Released: 6.0.3.0
Deprecated:

NvSciError NvSciEventLoopServiceCreate(size_t maxEventLoops, NvSciEventLoopService** newEventLoopService)

Safe version:
NvSciError NvSciEventLoopServiceCreateSafe(
    size_t maxEventLoops,
    void* config,
    NvSciEventLoopService** newEventLoopService);

Improved safety points:
- For QNX, it creates a private pulse pool which prevents DDOS attacks on the global pulse pool. The parameter config is passed to QNX API, ChannelCreatePulsePool(). The API depending on config sends semaphore event to a thread waiting the event when there is no room in pulse pool. Then the thread can do something to block suspicious event strom with the help of NvSciEventInspect()
For Linux, the functionality is same as unsafe one

Porting guideline:

NvSciEventLoopService *eventLoopService;
sem_t *sem_noti;
NvSciError err;
/* Assume a thread handling there are no available pulses in the pool */
struct nto_channel_config config = {
    .num_pulses = 5, /* number of pulses queue */
    .rearm_threshold = 0, /* 0 fires once and never rearms the notification with
    semaphore */
    .options = _NTO_CHO_CUSTOM_EVENT; /* semaphore event will be sent to a
    thread */
};
sem_noti = sem_open(SEM_ANON, O_ANON | O_CREAT, 0777, 0);
SIGEV_SEM_INIT(&config.event, sem_noti);
err = NvSciEventLoopServiceCreateSafe(1, &config, &eventLoopService);
/* add codes to handle err here */
/
* Create a thread waiting for sem_noti semaphore and when wakes up by the
* semaphore, do something like calling NvSciEventInspect() to block
* suspicious
* events which cause event storm
*/

Platform: QNX and Linux

Released: 6.0.4.0

Deprecated:

NvSciError NvSciIpcSetQnxPulseParam(NvSciIpcEndpoint handle, int32_t coid,
int16_t pulsePriority, int16_t pulseCode, void *pulseValue)

Safe version:

NvSciError NvSciIpcSetQnxPulseParamSafe(NvSciIpcEndpoint handle,
int32_t coid, int16_t pulsePriority, int16_t pulseCode);

Improved safety points:

The safe version does not support an application cookie input parameter with pulseValue to reroute unmasking interrupt.

Porting guideline:

Refer to the porting guidelines in NvSciEventInspect()
Platform: QNX
Released: 6.0.4.0
Deprecation:

NvSciError NvSciIpcGetEvent(NvSciIpcEndpoint handle, uint32_t *events)

Safe version:
NvSciError NvSciIpcGetEventSafe(NvSciIpcEndpoint handle, uint32_t *events)

Improved safety points:
- It unmaps interrupt with the correct procedure from QNX manual
- It enhances Inter-VM throughput by removing unnecessary QNX kernel calls
- It supports QNX OS 7.2 muon kernel
- For Linux, the functionality remains the same

Porting guidelines:
Refer to the porting guidelines in MsgReceivePulse_r()

Platform: QNX
Released: 6.0.4.0
Deprecation:

int MsgReceivePulse_r(int chid, void *pulse, size_t bytes, struct _msg_info *info)

Safe version:
int32_t NvSciIpcWaitEventQnx(int32_t chid, int64_t microseconds, uint32_t bytes, void *pulse)

Improved safety points:
- It unmaps interrupt with the correct procedure from QNX manual
- It supports timeout that is not blocked permanently
- This update is required only when MsgReceivePulse_r() is used to block IVC notification in D5.2

Porting guidelines:
#define APP_PULSE_CODE 10
NvSciIpcEndpoint IpcEndpoint;
int32_t coid;
int16_t priority = SIGEV_PULSE_PRIO_INHERIT;
int16_t code = APP_PULSE_CODE; /* application-defined code value */
int64_t timeout = 10000; /* 10 msec */
NvSciError err;
/*
 * Create channel and open endpoint
*/
* coid and ipcEndpoint are initialized properly
 */

err = NvSciIpcSetQnxPulseParamSafe(ipcEndpoint, coid, priority, code);
/* add codes to handle err here */

/* Get endpoint information and perform reset
 */

while (1) {
    err = NvSciIpcGetEventSafe(ipcEndpoint, &event);
    if (err != NvSciError_Success) {
        goto fail;
    }

    if (event & NV_SCI_IPC_EVENT_WRITE) {
        /* perform write operation */
    } else if (event & NV_SCI_IPC_EVENT_READ) {
        /* perform read operation */
    } else {
        err = NvSciIpcWaitEventQnx(chid, timeout, sizeof(pulse), &pulse);
        /* add codes to handle err here */
    }
}

Platform: QNX
Released: 6.0.4.0

Modified API:

NvSciError NvSciIpcGetEvent(NvSciIpcEndpoint handle, uint32_t *events)

The API adds one new event, which specifies that the remote endpoint receives all data that the local endpoint sends.

New event:

NV_SCI_IPC_EVENT_WRITE_EMPTY 0x10U ; write fifo is empty

Porting guideline:

NvSciError err;
Uint32_t event;

err = NvSciIpcGetEvent(handle, &event);
/* add codes to handle err here */

If (event & NV_SCI_IPC_EVENT_WRITE_EMPTY) {
    /* write buffer in queue becomes empty now it is time to fill in the buffer or close connection */
}
Note: This API is deprecated in 6.0.4.0. `NvSciIpcGetEventSafe()` supports the same event: `NV_SCI_IPC_EVENT_WRITE_EMPTY`

New API:

```cpp
```

The new API is similar to `NvSciEventLoopService::WaitForMultipleEvents()` but functions differently, depending on microseconds when `eventNotifierArray` is NULL.

1. microseconds > 0
   - Callbacks[event handler] continue to be served until the timeout occurs. If a callback is longer than the timeout, other callbacks associated with events, which arrive before timeout, are still served after timeout.
2. microseconds = -1 (NV_SCI_EVENT_INFINITE_WAIT)
   - Callbacks continue to be served and this API never returns.

Porting guideline:

Refer to `NvSciEventLoopService::WaitForMultipleEvents()`

Platform: QNX and Linux

Released: 6.0.3.0 in Linux and 6.0.4.0 in QNX

New API:

```cpp
```

It sets an event handler which is called in these functions when the pulse event associated with the notifier is arrived.

- `NvSciEventLoopService::WaitForObject()` or
- `NvSciEventLoopService::WaitForMultipleEvents()` or
- `NvSciEventLoopService::WaitForMultipleEventsExt()`

Porting guideline:

```cpp
NvSciIpcEndpoint ipcEndpoint;
NvSciEventNotifier *eventNotifier;
NvSciError err;
void * cookie;

void eventHandler(void *cookie)
{
    /* do something when it is called by the event */
}
```
/*
 * Open endpoint with EventService
 */

err = NvSciIpcGetEventNotifier(ipcEndpoint, &eventNotifier);
/* add codes to handle err here */

err = eventNotifier->SetHandler(eventNotifier, eventHandler, cookie, 0);
/* add codes to handle err here */

Platform: QNX and Linux
Released: 6.0.3.0 in Linux and 6.0.4.0 in QNX

New API:

NvSciError NvSciIpcInspectEventQnx(int32_t chid, uint32_t numPulses, uint32_t epCount, NvSciIpcEndpoint** epHandleArray)
It inspects events in queue, makes a decision on a rogue event and unregisters the event.

Porting guideline:

#define MAX_ENDPOINT /* It must be greater than all opened endpoint count in application process */
int32_t chid;
uint32_t numPulses; /* A threshold to unregister event */
uint32_t epCount = MAX_ENDPOINT;
NvSciIpcEndpoint epHandleArray[MAX_ENDPOINT];
NvSciIpcEndpoint *ptr = epHandleArray;
NvSciError err;

/*
 * Create channel and open endpoint
 * chid is initialized properly
 */

/* In a thread which wakes up by event indicating private pulse pool is full */
err = NvSciIpcInspectEventQnx(chid, numPulses, epCount, &epHandleArray)
/* add codes to handle err here */

Platform: QNX
Released: 6.0.4.0

New API:

The API inspects events in queue associated with EventService, makes a decision on a rogue event, and unregisters the event.
Porting guideline:
#define MAX_NOTIFIER /* It must be greater than all created notifier in application process */
NvSciEventLoopService *eventLoopService;
uint32_t numEvents; /* A threshold to unregister event */
uint32_t notiCount = MAX_NOTIFIER;
NvSciEventNotifier *notiArray[MAX_NOTIFIER];
NvSciError err;

/*
 * Create EventLoopService and Notifiers
 * eventLoopService is initialized properly
 */

/* In a thread which wakes up by event indicating private pulse pool is full */
err = NvSciEventInspect(&eventLoopServiceP->EventService, numEvents, notiCount, &notiArray[0])

/* add codes to handle err here */

Platform: QNX
Released: 6.0.4.0

New API:

NvSciError NvSciIpcCheckVersionCompatibility(uint32_t majorVer, uint32_t minorVer, bool* isCompatible)

The API indicates if the loaded NvSciIpc library is compatible with the given version.

Porting guideline:

bool compatible;
NvSciError err;

err = NvSciIpcCheckVersionCompatibility(NvSciIpcMajorVersion, NvSciIpcMinorVersion, &compatible);
if ((err != NvSciError_Success) && (compatible != true)) {
    /* there is an error or the version is not compatible */
}

Platform: QNX and Linux
Released: 6.0.4.0

New API:

NvSciError NvSciEventCheckVersionCompatibility(uint32_t majorVer, uint32_t minorVer, bool* isCompatible)

The API indicates if the loaded NvSciEventService library is compatible with the given version.
Porting guideline:

```c
bool compatible;
NvSciError err;

err = NvSciEventCheckVersionCompatibility(NvSciEventMajorVersion,
                                           NvSciEventMinorVersion, &compatible);
if ((retval != NvSciError_Success) || (compatible != true)) {
   /* there is an error or the version is not compatible */
}
```

Platform: QNX and Linux
Released: 6.0.4.0

PKCS#11 API Changes

Table 33: Migrating PKCS#11 Library from 5.2 to 6.0

The following table describes PKCS#11 Library changes from Drive OS 5.2 to 6.0

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Update from PKCS11-Base-v2.40 to PKCS11-Base-v3.0 headers</strong></td>
<td>Removed contents but retained files</td>
</tr>
<tr>
<td>Header File:</td>
<td></td>
</tr>
<tr>
<td>nvpks11_future.h</td>
<td></td>
</tr>
<tr>
<td>nvpks11f_future.h</td>
<td></td>
</tr>
<tr>
<td>Header File:</td>
<td></td>
</tr>
<tr>
<td>pkcs11f.h</td>
<td></td>
</tr>
<tr>
<td>API:</td>
<td></td>
</tr>
<tr>
<td>ADDED</td>
<td></td>
</tr>
<tr>
<td>C_GetInterfaceList</td>
<td>APIs added as a result of updating from PKCS11-Base-v2.40 to PKCS11-Base-v3.0 header</td>
</tr>
<tr>
<td>C_GetInterface</td>
<td></td>
</tr>
<tr>
<td>C_LoginUser</td>
<td></td>
</tr>
<tr>
<td>C_SessionCancel</td>
<td></td>
</tr>
<tr>
<td>C_MessageEncryptInit</td>
<td></td>
</tr>
<tr>
<td>C_EncryptMessage</td>
<td></td>
</tr>
<tr>
<td>C_EncryptMessageBegin</td>
<td></td>
</tr>
<tr>
<td>C_EncryptMessageNext</td>
<td></td>
</tr>
<tr>
<td>C_MessageEncryptFinal</td>
<td></td>
</tr>
<tr>
<td>C_MessageDecryptInit</td>
<td></td>
</tr>
</tbody>
</table>
## Header File and API

<table>
<thead>
<tr>
<th>Function</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_DecryptMessage</td>
<td></td>
</tr>
<tr>
<td>C_DecryptMessageBegin</td>
<td></td>
</tr>
<tr>
<td>C_DecryptMessageNext</td>
<td></td>
</tr>
<tr>
<td>C_MessageDecryptFinal</td>
<td></td>
</tr>
<tr>
<td>C_SignMessageBegin</td>
<td></td>
</tr>
<tr>
<td>C_SignMessageNext</td>
<td></td>
</tr>
<tr>
<td>C_VerifyMessageBegin</td>
<td></td>
</tr>
<tr>
<td>C_VerifyMessageNext</td>
<td></td>
</tr>
</tbody>
</table>

### Header File: pkcs11t.h

Updated from PKCS11-Base-v2.40 to PKCS11-Base-v3.0 header

### Header File: nvpkcs11.h

Moved version 3.0 message based APIs from NV_CK_FUNCTION_LIST as these are now included in CK_FUNCTION_LIST_3_0. PKCS#11 library supports 3 interfaces:

- “PKCS 11”: this interface name represents 2 interfaces, one which is associated with the Oasis standards version 3.0 CK_FUNCTION_LIST_3_0 structure and the other with the Oasis standards version 2.40 CK_FUNCTION_LIST structure.
- “Vendor NVIDIA”: this interface name is associated with NV_CK_FUNCTION_LIST structure that contains NVIDIA extension APIs.

### API:

- REMOVED
- C_NvGetFunctionList
- MOVED
- C_MessageSignInit
- C_SignKey
- C_MessageSignFinal
- C_MessageVerifyInit
- C_VerifyMessage
- C_MessageVerifyFinal

### Header File: nvpkcs11.h

Removed batch message extension APIs

### API:

- REMOVED
- C_SignBatchMessage
- C_VerifyBatchMessage

---

### PKCS#11 public APIs that changed in terms of signatures and parameters

- **C_UnwrapKey**
  - Changed supported unwrap mechanism from CKM_AES_CCM to CKM_AES_GCM.
<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Changes within key metadata storage layout and content necessitate all keys prepared offline with PKCS#11 Object Generation Tool to be revisited using the tool aligned with the DRIVE OS release in use.</td>
</tr>
<tr>
<td></td>
<td>CKA_TOKEN determines if a key is a Token key when unwrapped within a R/W session.</td>
</tr>
<tr>
<td>C_DeriveKey</td>
<td>Changed fused base key CKA_ID from NV_OEM_KEK2. Refer to PDK Documentation aligned with the DRIVE OS release in use.</td>
</tr>
<tr>
<td></td>
<td>Fused base keys are GENERIC_SECRET type requiring the prf passed into CKM_SP800_108_COUNTER_KDF to be SHA256_HMAC.</td>
</tr>
<tr>
<td></td>
<td>Template attribute CKA_KEY_TYPE mandatory for the derive operation.</td>
</tr>
<tr>
<td></td>
<td>If the base key has its CKA_NEVER_EXTRACTABLE attribute set to CK_FALSE, then the derived key will too. If the base key has its CKA_NEVER_EXTRACTABLE attribute set to CK_TRUE, then the derived key has its CKA_NEVER_EXTRACTABLE attribute set to the opposite value from its CKA_EXTRACTABLE attribute.</td>
</tr>
<tr>
<td></td>
<td>If the base key has its CKA_ALWAYS_SENSITIVE attribute set to CK_FALSE, then the derived key will as well. If the base key has its CKA_ALWAYS_SENSITIVE attribute set to CK_TRUE, then the derived key has its CKA_ALWAYS_SENSITIVE attribute set to the same value as its CKA_SENSITIVE attribute.</td>
</tr>
<tr>
<td></td>
<td>CKM_SP800_108_COUNTER_KDF Input Parameters: The byte 0x00 is not allowed within Label or Context of the PRF input data fields</td>
</tr>
</tbody>
</table>
### Header File and API

<table>
<thead>
<tr>
<th>API</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_FindObjectsInit</td>
<td>Template attribute CKA_CLASS is mandatory.</td>
</tr>
</tbody>
</table>
| All APIs associated with a template | CKA_CHECK_VALUE is not supported  
CKA_UNIQUE_ID is not supported |

### Board Support Packages (BSP) API Changes

#### Table 34: QNX BSP Driver

<table>
<thead>
<tr>
<th>Device</th>
<th>Change Description</th>
</tr>
</thead>
</table>
| I2C Driver | DCMD_I2C_DRIVER_INFO is deprecated and should be removed  
Operation mode of DCMD_I2C_BUS_RESET changed from INIT/DEINIT to INIT/RUNTIME/DEINIT.  
DCMD_I2C_BUS_RESET is available anytime  
The return values of QNXBSP I2C API changed.  
Customers should be careful when checking for the return value from the QNXBSP I2C driver  
i2c.h is deprecated and replaced with nvi2c_devctl.h.  
Customers should replace i2c.h with nvi2c_devctl.h |

### DRIVE Update Changes

The following table describes Drive Update changes from Drive 5.1 to 6.0

#### Table 35. Drive Update Changes from 5.1 to 6.0

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Change Description</th>
</tr>
</thead>
</table>
| Header File: nvdriveupdate.h | • LCAPI has been deprecated since 5.2 and is removed in 6.0. This applies to the following APIs:  
> NvStartDeployPackage |
The following table describes Drive Update changes from Drive OS 5.2 to 6.0.

Table 36. Drive Update Changes from 5.2 to 6.0

<table>
<thead>
<tr>
<th>Header File and API</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>API:</strong> dulink.h</td>
<td>The <code>pBuf</code> parameter is changing from <code>void*</code> to <code>void const*</code></td>
</tr>
<tr>
<td></td>
<td>Following typedefs will be removed</td>
</tr>
<tr>
<td></td>
<td>- <code>PDULINK_ACL_ENTRY</code></td>
</tr>
<tr>
<td></td>
<td>- <code>PDULINK_ATTR</code></td>
</tr>
<tr>
<td></td>
<td><code>dulink</code> IO operations will support configurable synchronous timeouts via a new API. The default timeout is 60s.</td>
</tr>
<tr>
<td><strong>API:</strong> dulink</td>
<td>The following typedefs will be removed</td>
</tr>
<tr>
<td></td>
<td>- <code>PDUTR_SEC_PARAM</code></td>
</tr>
<tr>
<td></td>
<td>- <code>PDUTR_IVC_PARAM</code></td>
</tr>
<tr>
<td></td>
<td>- <code>PDUTR_SHMITC_PARAM</code></td>
</tr>
<tr>
<td></td>
<td>- <code>DUTR_SHMIPC_PARAM, PDUTR_SHMIPC_PARAM</code></td>
</tr>
<tr>
<td></td>
<td>- <code>PDUTR_TCP_IF_PARAM</code></td>
</tr>
<tr>
<td></td>
<td>- <code>PDUTR_TCP_PARAM</code></td>
</tr>
</tbody>
</table>
### Header File and API

<table>
<thead>
<tr>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; PDUTR_TR_PARAM</td>
</tr>
<tr>
<td>• The following enums will be removed</td>
</tr>
<tr>
<td>&gt; DUTR_TR_TYPE_SHM_ITC</td>
</tr>
</tbody>
</table>

### Header File:

**ducc.h**

### API:

**DUCC**

### Metadata

A new optional parameter updates chain C or chain D. There’s no impact on the current update package if you only plan to use chain A or chain B

---

## TensorRT API Changes

**Table 37** **API Changes**

The following table describes changes for 6.0.1, 6.0.2, and 6.0.3.

<table>
<thead>
<tr>
<th>Interface</th>
<th>Affected</th>
<th>Action</th>
<th>Impact</th>
<th>Impacted Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILogger::log</td>
<td>Logging interface</td>
<td>Thread safety is now documented as being required for implementations of ILogger::log. Previous documentation did not require this.</td>
<td>Custom logging implementations of ILogger::log provided by applications that are not thread safe must be rewritten to be thread safe.</td>
<td>6.0.3</td>
</tr>
<tr>
<td>getPluginRegister</td>
<td>Safe runtime</td>
<td>Added getSafePluginRegistry for safe runtime.</td>
<td>Impacts user code.</td>
<td>6.0.1</td>
</tr>
<tr>
<td>Interface</td>
<td>Affected</td>
<td>Action</td>
<td>Impact</td>
<td>Impacted Release</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------</td>
<td>-------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>REGISTER_TENSORRT_PLUGIN</td>
<td>Safe runtime</td>
<td>Renamed to REGISTER_SAFE_TENSORRT_PLUGIN</td>
<td>Impacts user code.</td>
<td>6.0.1</td>
</tr>
<tr>
<td>IPluginChecker::getPluginType</td>
<td>Standard and safe runtimes</td>
<td>Renamed to getPluginName for consistency.</td>
<td></td>
<td>6.0.1</td>
</tr>
<tr>
<td>IPluginRegistry::deregisterCreator</td>
<td>Standard and safe runtimes</td>
<td>New method for deregistering plugins.</td>
<td>No impact to existing code.</td>
<td>6.0.1</td>
</tr>
<tr>
<td>IPluginChecker</td>
<td>Consistency checker</td>
<td>Updated to inherit from IPluginCreator.</td>
<td>Impacts user code.</td>
<td>6.0.1</td>
</tr>
<tr>
<td>IPluginCheckerRegistry::registerPlugin</td>
<td>Consistency checker</td>
<td>Use IPluginRegistry::registerCreator.</td>
<td>Impacts user code.</td>
<td>6.0.1</td>
</tr>
<tr>
<td>IPluginCheckerRegistry::getPluginChecker</td>
<td>Consistency checker</td>
<td>Use IPluginRegistry::getPluginCreator.</td>
<td>Impacts user code.</td>
<td>6.0.1</td>
</tr>
<tr>
<td>IPluginCheckerRegistry</td>
<td>Consistency checker</td>
<td>Removed.</td>
<td>Impacts user code.</td>
<td>6.0.1</td>
</tr>
<tr>
<td>NvInferRuntimeSelect.h</td>
<td>Standard and safe runtimes</td>
<td>Removed.</td>
<td>Impacts user code.</td>
<td>6.0.1</td>
</tr>
<tr>
<td>NvInferConsistency.h</td>
<td>Consistency checker</td>
<td>Updated to use pointer-to-implementation.</td>
<td>No impact to user code</td>
<td>6.0.1</td>
</tr>
<tr>
<td>Interface</td>
<td>Affected</td>
<td>Action</td>
<td>Impact</td>
<td>Impacted Release</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------------</td>
<td>--------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Proxy runtime split into libnvinfer_safe.so</td>
<td>Proxy runtime</td>
<td>Proxy runtime split from libnvinfer.so to separate library.</td>
<td>Impacts user code (linking)</td>
<td>6.0.2</td>
</tr>
<tr>
<td>IBuilderConfig::getMemoryPoolLimit</td>
<td>TensorRT builder</td>
<td>New API</td>
<td>No impact to user code</td>
<td>6.0.2</td>
</tr>
<tr>
<td>IBuilderConfig::setMemoryPoolLimit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICaffeParser::parseBuffers</td>
<td>Caffe parser</td>
<td>Type updated from char* to uint8_t*</td>
<td>No impact to user code</td>
<td>6.0.2</td>
</tr>
</tbody>
</table>
Appendix: Additional Resources

For information about NVIDIA products and resources, refer to the NVIDIA Documentation Center and the NVIDIA DeveloperZone.
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