NVIDIA DRIVE OS 6.0.8.1 Linux

Release Notes

DA-08634-005
NVIDIA CONFIDENTIAL

August 2023
Prepared and Provided Under NDA

Table of Contents

Introduction

The NVIDIA DRIVE® OS 6.0 Linux Release Notes are for NVIDIA DRIVE AGX Orin™ Development Kits.

Note: **This DRIVE OS release may only be used for test and development.**

NVIDIA DRIVE OS is the reference operating system and associated software stack, which includes CUDA, TensorRT, NvMedia, NvStreams, and Developer Tools, designed specifically for developing and deploying autonomous applications on DRIVE AGX-based hardware. DRIVE OS includes the NVIDIA DriveWorks SDK as a foundation for autonomous vehicle (AV) software development. The DriveWorks SDK provides an automotive-grade middleware with accelerated algorithms and versatile tools.

DRIVE OS Development Kits

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

Note: **The NVIDIA DRIVE OS Platform Development Kit (PDK) is only available to NVONLINE users.**

NVIDIA DRIVE OS Platform Development Kit (PDK) is used to adapt NVIDIA DRIVE OS to run on custom hardware based on NVIDIA Automotive SoC (i.e., Orin).

DRIVE OS Base Operating Systems

DRIVE OS Linux “Standard”

DRIVE OS Linux “Standard” is a reference platform based on Ubuntu 20.04 LTS Linux, which is intended for prototyping and development of autonomous vehicle platforms. DRIVE OS Linux is production ready but does not go through the same safety assessment as DRIVE OS QNX for Safety.

Release Highlights

Key Features in this Release

For a complete list of new features and enhancements in this release, see New Features and Enhancements.

Deprecations in this Release

The following items are deprecated in this release:

Summary	Module	Impact
P_SendSeed interface is deprecated from FSI_FOH.	MCU	P-McuData is added to notify data from MCU in a 252 byte array.

Planned Upcoming Changes

The following sections describe planned, upcoming changes.

Summary	Module	Impact
The Secondary IFS will be renamed in 6.0.9 from `guest_vm_safety_secondary*` to `guest_vm_secondary_safety*`.	Filesystem	This change is being made to standardize the naming convention of all the Guest VMs in Drive OS QNX Safety. Most guest VMs (e.g., orin_gos_vm_safety) append “safety” at the end of the name. Thus, the correct name for the secondary IFS is guest_vm_secondary_safety. If you are or know anyone who has build/packaging scripts that modify the safety secondary IFS, ensure you use the new secondary IFS name, or your build scripts may fail.
In 6.0.9, FSI prefix will be removed in the file names for WDG MCAL module. The	FSI	There is no functional impact. Closed box customers are not impacted. Older file names will not be available and using them will lead to

following lists the name changes: • `Wdg_Fsi.h to Wdg.h` • `Wdg_Fsi.c to Wdg.c` `Wdg_Fsi_Irq.c to Wdg_Irq.c`		compilation errors.
There is an update in buffer size of SPI communication between FSI and MCU starting from 6.0.8.1 to accommodate interface changes in FSI FOH and MCU FOH as described in the MCU Firmware section.	MCU Firmware	This update only impacts error reporting from FSI to MCU. If MCU and FSI firmware is not compatible, error reporting to MCU is not functional. The safe shutdown, SC7, and DRAM Page retirement does not work with incompatible firmware as these use cases are dependent on SPI communication. Other MCU SW and FSI SW functionalities are not impacted.

New Features and Enhancements

This release includes support for these new features and enhancements.

New Features for DRIVE OS

DebugDump API

DebugDump API is not supported in NvSciSync and NvSciBuf and has been removed.

PKCS#11: CKM_NVIDIA_AES_GCM_KEY_UNWRAP Custom Unwrap Mechanism

Depending on the combination of how the supported mechanism in the unwrapping key is named and how the unwrapping mechanism is named when C_UnwrapKey is called, the PKCS#11 library reacts according to 1 of the 4 possible combinations below in 6.0.8.1.

		UnwrapKey mechanism	
		CKM_AES_GCM	***CKM_NVIDIA_AES_GCM_KEY_UNWRAP***
Supported mechanism in the unwrapping key	***CKM_AES_GCM***	1 • If pTemplate == NULL unwrap using CKM_NVIDIA_AES_GCM_KEY_UNWRAP Log ("Update unwrapping mechanism and key supported mechanisms") • If pTemplate != NULL return CKR_ARGUMENTS_BAD (not supported as of 6.0.8.1)	2 • If pTemplate == NULL unwrap using CKM_NVIDIA_AES_GCM_KEY_UNWRAP Log("Update key supported mechanisms") • If pTemplate != NULL return CKR_ARGUMENTS_BAD
	CKM_NVIDIA_AES_GCM_KEY_UNWRAP	3 • return CKR_MECHANISM_INVALID	4 • If pTemplate == NULL unwrap using CKM_NVIDIA_AES_GCM_KEY_UNWRAP • If pTemplate != NULL return CKR_ARGUMENTS_BAD

If you have been provisioning keys using the original mechanism and have made no changes, it will still work in 6.0.8.1. The library issues an advisory log to update to the new custom mechanism naming scheme for that use case.

MCU Firmware

The interfaces of FSI FOH and MCU FOH are updated.

Updates on FSI_FOH:

The interface R_McuPeriodicReport on FSI_FOH is updated to receive a 252 byte array instead of a definite structure from SEH. P_SendSeed interface is deprecated from FSI_FOH and P_McuData is added to notify data from MCU in a 252 byte array.

Updates on MCU_FOH:

The interface on MCU_FOH, P_McuPeriodicReport is updated to send a 252 byte array instead of a definite structure to MCU Application. R_SendSeed interface is deprecated from MCU_FOH and R_McuData is added to send MCU data in 252 byte array to FSI.

With these updates, the interface is opaque to the data content and the application can define the data types for data exchange between MCU and FSI. In 6.0.8.1 and future releases, applications on MCU and FSI must adapt to these interface updates.

As a direct impact of the above enhancement, there is an update in buffer size of SPI communication between FSI and MCU starting from 6.0.8.1. This update only impacts error reporting from FSI to MCU. If MCU and FSI firmware is not compatible, error reporting to MCU is not functional. The safe shutdown, SC7, and DRAM Page retirement does not work with incompatible firmware as these use cases are dependent on SPI communication. Other MCU SW and FSI SW functionalities are not impacted.

Support for Public Key Token Object Creation Using C_CreateObject

C_CreateObject for public key objects have been updated in 6.0.8.1. This supports customers who need to provision token public keys into secure storage using C_CreateObject.

Fixed Issues

The following DRIVE OS and DriveWorks issues from the previous release are resolved in this release:

Feature	Module	Description
3983073	Display	**What was the issue?** SOR and RG FMON Violation - You might have seen errors with ReporterId-0xe04c, such as "MCU_FOH: ErrReport: ErrorCode-0x28da ReporterId-0xe04c Error_Attribute-0x0 Timestamp-0x13a51bd" on the MCU console during boot. These were violations reported by FMON function due to setting of SOR and RG clocks without notifying BPMP module about the clock change. devg-modeset module must have disabled monitoring clocks for SOR and RG while updating SOR and RG clocks. **How did it impact the customer?** When nvidia.ko module was loaded by modprobe command as part of boot-up process before launching any display application, this issue occurred. This did not impact you as this violation was for monitoring clocks only. It only identified that something in clocks changed without disabling monitoring clocks. **Is it for SDK/PDK?** Both
4079505	Filesystem	**What was the issue?** The kernel K5.10 built many of the loadable kernel modules (*.ko), and all kernel modules were copied to the filesystem regardless of whether they were used. This was suboptimal as they would not get loaded or got loaded but not used. These modules occupied unnecessary storage space in the filesystem, and there were security concerns with too many unused modules. With kernel K5.15, DRIVE OS enables and copies only the essential kernel modules to the K5.15 root filesystem, which has known use cases. The kernel modules packaged in the filesystem currently for K5.15 is verified to be sufficient to cover the known use cases in DRIVE OS LINUX. The specific use case has issues if the customer has specific use cases on K5.15, which depend on kernel modules unavailable in the K5.15 filesystem that comes with SDK/PDK. **How did it impact the customer?** If the software used in your use case depended on the .ko file, then the software did not run. **Was it for SDK/PDK?** Both

4201063	Filesystem	**What was the issue?** Mellanox driver sources were not packaged in the SDK. Support, along with instructions to rebuild Mellanox kernel modules, was unavailable due to SDK limitations. **How did it impact the customer?** You were not able to rebuild Mellanox kernel modules from sources. **Was it for SDK/PDK?** Both
4193291	DRIVE Update	**What was the issue?** DUPKG tool before 6.0.8.0 only supported the package generation with the partition images from its same release. Starting from 6.0.8.0, DUPKG tool is able to support DRIVE Update package generation with partition image since 6.0.7.0. **How did it impact the customer?** Using DUPKG tool earlier than from 6.0.8.0 release to generate with cross version images might have failed. **Was it for SDK/PDK?** Both
4180423	System Software	**What was the issue?** Could not detect some USB cameras in 6.0.8. Those cameras were free drivers in 6.0.7 and before. **How did it impact the customer?** Some USB cameras were free drivers in 6.0.7 and before. Camera samples could not open some USB cameras directly due to a missing driver. **Was it for SDK/PDK?** SDK

Known Issues

Note: Due to the introduction of enhanced persistent partition workflow, if you are upgrading from DRIVE OS 6.0.4 to the current DRIVE OS version and using `-init` persistent partitions, follow all the steps mentioned under the Data Migration for Persistent Partitions chapter in the *DRIVE OS 6.0 Linux SDK Developer Guide*.

These are issues discovered during development and QA and are scheduled to be resolved in a future release.

Feature	Module	Description
4229331	Camera	**What is the issue?** IMX623/IMX728 sensor sends image metadata called embedded metadata per frame along with image data. This metadata is sent before the image (top embedded data) and after the image (bottom embedded data). Currently, the API called ParseCustomEmbeddedData exposed to the DRIVE OS user mentions the ability to parse both top and embedded data by taking in the top and bottom embedded data buffer, whereas the API only supports parsing top embedded data. The API can only parse top embedded data. **How does it impact the customer?** You cannot get parse information from the bottom embedded data using DRIVE OS API. **If there is a workaround, what is it?** Since the embedded data structure is exposed by Sony and hence available to DRIVE OS users, you can do the parsing yourself if you need to extract information. **When can we expect the fix?** 6.0.9.0 **Is this Standard/Safety?** Both **Is it for SDK/PDK?** Both
4250600	Virtualization	**What is the issue?** The storage (UFS/EMMC/QSPI) priority scheduling feature has bugs, due to which storage priority scheduling may not be done correctly in all cases as per the storage partitions priority. **How does it impact the customer?** In some cases, high priority partitions requests may not get serviced before low priority partitions.

		If there is a workaround, what is it? N/A **When can we expect the fix?** 6.0.9 **Is this Standard/Safety?** Both **Is it for SDK/PDK?** Both
4250694	FSI	**What is the issue?** KAT tests are not enabled for all algorithms. **How does it impact the customer?** • Impact is low. • KAT already runs for GCM, CMAC, SHA, and RSA algorithms at startup. If any KAT tests fail, FSISW boot is not done. • KAT tests are not run for these algorithms, but the job is triggered when requested: ED25519, CBC, GMAC. • Ephemeral tests and startup tests are present as verification, which check the responses to all these algorithms and makes sure that the response is received in time (both failure or pass cases). **If there is a workaround, what is it?** Open box customers can run KAT tests before running these algorithms in case verification is needed. There is no workaround for closed box FSI customers. **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** Applies to FSISW open and closed box customers.
4184332	System Software	**What is the issue?** Yocto build fails intermittently with compilation failure in Vulkan-samples reporting out of memory error. **How does it impact the customer?** Customers building Yocto with bitbake may hit this failure intermittently when several other bitbake tasks are running. **If there is a workaround, what is it?** Yes, re-attempt the build to resolve intermittent issue. **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** Both
4190302	System Software	**What is the issue?** Although SC7_DRAM_AUTHENTICATION is not enabled by default for DRIVE OS Linux builds, DRAM_Authentication disabled causes SC7 entry failure on P3898. **How does it impact the customer?** Customers using P3898 are unable to enter SC7. **If there is a workaround, what is it?**

		SC7_DRAM_AUTHENTICATION has been kept enabled for P3898 platform. Although this increases boot time, this still meets the committed resume KPIs of 2 seconds for P3898. **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** Both
3928416	HSI	**What is the issue?** You may see error spews on MCU console during boot, with the following error code. This indicates an HSI EQOS RX FMON error while enabling FMON clock: `MCU_FOH: ErrReport: ErrorCode-0x28de ReporterId-0xe04c Error_Attribute-0x0 Timestamp-0xa4fc08e.` **How does it impact the customer?** There is no impact on the data transfers. T EQOS FMON monitoring for RX CLK may not work. **If there is a workaround, what is it?** No workaround. **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** SDK
4169204	Camera Core	**What is the issue?** Sample camera application crashes when running with Test Pattern Generator (TPG) from DS90UB971 FPD-Link serializer. **How does it impact the customer?** The impact is minimal since the issue is only observed with TPG, not actual FPD-Link sensors. **If there is a workaround, what is it?** No workaround. **When can we expect the fix?** TBD **Is it for SDK/PDK?** PDK
4195508	DRIVE Update	**What is the issue?** Starting from 6.0.8.0, security mandates that one DRIVE Update deployment must include PVIT update if the system has PVIT enabled. **How does it impact the customer?** When constructing the metadata manually in cases like delta update, PVIT partition must be included as part of the deployment; otherwise, install_unlock fails. **If there is a workaround, what is it?** If you do not want to use PVIT update, include "`ENABLE_PVIT=n`" when binding the partition prior to flashing. **When can we expect the fix?** This is a change in behavior due to a security requirement. Documentation will be updated in the next release.

		Is it for SDK/PDK? Both
4174916	Nsight	Accelerator workload events for VIC, OFA, NVENC and NVDEC are missing (missing job_timestamps ftrace events).
4174916	Nsight	Clicking on accelerator workload events for VI will not reveal the corresponding API call that launched the job (missing vi_task_submit ftrace event).
4184360	Nsight	When remote profiling from the host x86_64, accelerator workload events are not collected.
4115578	Nsight	When localhost profiling on the target arm64 using nsys-ui GUI, accelerator workload events are not collected.
4190938	Nsight	Accelerator workload events for PVA in specific scenarios might not be displayed correctly.
4193687	Nsight	Tegra accelerator workload events in specific scenarios might disappear when zooming in on the timeline.
3961157	Camera Core	**What is the issue?** Demosaic of RGB-IR sensors in nvsipl_camera is not supported. When `--enableRawOutput` is used with Display in nvsipl_camera, the app fails. **How does it impact the customer?** You cannot display raw output of RGB-IR sensors. **If there is a workaround, what is it?** N/A **When can we expect the fix?** 6.0.9 Note: A demosaic'd image will not be displayed; a monochrome image created using G and IR components will be displayed. **Is it for SDK/PDK?** Both
4087839	System Software	**What is the issue?** In bind phase of the build, storage configuration may throw the warning message: “WARNING: Uniqueness failure: Reuse of SID value:”. **How does it impact the customer?** The Warning "WARNING: Uniqueness failure: Reuse of SID value:" can be ignored for Linux and boot chain C builds. **If there is a workaround, what is it?** N/A **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** Both
4079771	NvDisplay	**What is the issue?** HDMI is not enabled by default in AV+L build for any of devkit reference boards. **How does it impact the customer?** Platforms with HDMI connector output do not work by default. **If there is a workaround, what is it?**

		Follow the steps in the Enabling HDMI chapter under NvDisplay to enable HDMI on your board. **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** Both
4070042	Kernel	**What is the issue?** sestatus tool is not available in the Linux RFSes for Linux K5.15 while it is still available in RFSes for Linux K5.10. **How does it impact the customer?** You are not able to use sestatus in K5.15 DRIVE OS package. **If there is a workaround, what is it?** The same information can be extracted from other source such as /sys/fs/selinux/status. You can also `apt install policycoreutils` to get the command installed/supported on the target system. **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** Both
3950134	Safety MCU Firmware	**What is the issue?** On the P3663-TS3 board, SAFETY_NIRQ is low during SC7 exit, which leads to the error print "ERROR: MCU_PLTFPWRMGR: Request Orin SC7 Exit failed!". As this is a safety check, it has no functional impact. **How does it impact the customer?** You see error print "ERROR: MCU_PLTFPWRMGR: Request Orin SC7 Exit failed!" though SC7 exit is successful. As this is a safety check, it has no functional impact. **If there is a workaround, what is it?** N/A **When can we expect the fix?** As the issue is seen on only a particular board, analysis/fix will take more time and it is planned to be completed by 6.0.9. **Is it for Standard/Safety, SDK/PDK** All
3895994	System Software	**What is the issue?** SC7 Suspend->Resume causes hang intermittently. Issue seen once in 25 cycles of Suspend-Resume. Issue occurs if suspend-resume is triggered in a loop. **How does it impact the customer?** System will be in hang state if this issue is hit **If there is a workaround, what is it?** Need a power reset to come out of this state **When can we expect the fix?** 6.0.9 **Is this Standard?** Issue is seen on Linux, PCT Configuration : AV+L

		Is it for SDK/PDK? All
3854952	DRIVE Update	**What is the issue?** DRIVE Update deploy fails with delay greater than 10s in reboot.json. **How does it impact the customer?** There is no max delay documented anywhere, which may cause customer DRIVE Update deploy fail. **If there is a workaround, what is it?** Maximum value of delay in reboot.json is 10s. **When can we expect the fix?** No fix. Avoid the DRIVE Update deploy failure caused by an inappropriate delay value. **Is it for SDK/PDK?** Both
3644537	Virtualization	**What is the issue?** Host initiated Refresh (HIR) operation on Micron eMMC device takes around 7 seconds to complete **How does it impact the customer?** If initiated refresh on Micron eMMC from SW, then EMMC becomes busy and no other requests (such as read/write/erase etc.,) are sent to EMMC for that busy period. **If there is a workaround, what is it?** There is no workaround available. Micron is going to provide the eMMC firmware update to reduce the HIR time to 400ms (projected time from Micron). Please check with Micron for more details on this. **When can we expect the fix?** This fix is expected from Micron as an eMMC firmware update. After the new eMMC firmware provided from Micron, it must be flashed to eMMC. For more details, check with Micron. **Is it for SDK/PDK?** All
3769858	Display	Assert observed when display driver kernel modules are loaded.
3793667	Camera	**What is the issue?** When isGroupInitProg flag in DeviceBlockInfo structure is set, the links must be initialized in incremental order. **How does it impact the customer?** If the link order is not incremental, some cameras are not initialized correctly so the application cannot receive the frames from the uninitialized cameras. **If there is a workaround, what is it?** The user initializes the cameras in the incremental link order when isGroupInitProg flag is set. **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** Both

200775377	System Software	**What is the issue?** PTP client connected to DRIVE Orin AGX Developer Kit 88Q6113 (Spruce) ethernet switch port P7 fails to sync with PTP server due to known bug from Marvell switch firmware. **How does it impact the customer?** Any sensor/device connected to spruce port P7 is not able to sync with PTP server. **If there is a workaround, what is it?** N/A **When can we expect the fix?** The issue is being addressed with the vendor; resolution date is TBD. **Is it for SDK/PDK?** All.
200618961	System Software	**What is the issue?** Low fps observed while replaying sf3324/820 lraw/raw camera recordings with sample_camera_replay **How does it impact the customer?** Cannot replay sf3324/820 lraw/raw camera recordings smoothly via the Camera Replay Sample. **If there is a workaround, what is it?** N/A **When can we expect the fix?** N/A **Is it for SDK/PDK?** SDK
3925474		**What is the issue?** Header dump tool failed for lidar and radar with error: Could not cast to virtual sensor. [TC ID: 41643, 41645] **How does it impact the customer?** Cannot dump lidar/radar header by using header-dump **If there is a workaround, what is it?** N/A **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** SDK
4184657		**What is the issue?** sample_camera cannot replay multi RAW/LRAW videos that are recorded from cameras connected to the same link index. **How does it impact the customer?** Cannot replay multi videos with same input, RAW/LRAW include link index information, cannot replay same index video at the same time. **If there is a workaround, what is it?** N/A **When can we expect the fix?** Next release **Is it for SDK/PDK?**

		SDK
4203303		**What is the issue?** Calibration recorder tool failed with input lraw/raw videos. **How does it impact the customer?** Calibration recorder tool cannot work with input lraw/raw videos. **If there is a workaround, what is it?** N/A **When can we expect the fix?** Next release **Is it for SDK/PDK?** SDK
4064878		**What is the issue?** Recorder tool record lraw file that is not encoded as lossless. **How does it impact the customer?** Cannot use recorder tool to record lossless lraw data. **If there is a workaround, what is it?** N/A **When can we expect the fix?** Next release **Is it for SDK/PDK?** SDK
4203115		**What is the issue?** sample_connected_components showing black rendering screen for both raw/lraw video **How does it impact the customer?** sample_connected_components cannot work with input raw/lraw videos. **If there is a workaround, what is it?** N/A **When can we expect the fix?** Next release **Is it for SDK/PDK?** SDK
4064784		**What is the issue?** sample_feature_descriptor fails with raw video input, Driveworks exception thrown: Bad access of safety result (underflow error) **How does it impact the customer?** Cannot run sample_feature_descriptor with raw video **If there is a workaround, what is it?** N/A **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** SDK
	Image and	The following algorithms are not supported on Orin's OFA and/or PVA engines in

	Point Cloud Processing	this release: • ImageFilter (Recursive Gaussian Filter, BoxFilter, 2Dconv). • FAST9 Feature Detector, Standard Harris Corner Detector. • IC and fastIC Feature Tracker. • DenseOpticalFlow. • Stereo. • Template Tracker.
3496936		**What is the issue?** Sample_stereo_disparity dumps "Error calling GL deleter" on console **How does it impact the customer?** The same error log may occur during DriveWorks release. But it won't impact functionality. **If there is a workaround, what is it?** N/A **When can we expect the fix?** N/A **Is it for SDK/PDK?** SDK
		Tensor Streaming is not operational in this release.
200782352	SAL	LRAW Preview Extraction Tool fails.
3494734		**What is the issue?** Some networks may suffer accuracy degradation when run on DLA with large batch sizes. **How does it impact the customer?** When running networks on DLA with batch sizes larger than 32, accuracy may degrade. **If there is a workaround, what is it?** To work around this issue, use a smaller batch size. **When can we expect the fix?** The issue will be fixed in a future DLA release. **Is it for SDK/PDK?** SDK
3498326		**What is the issue?** There is a known issue with DLA clocks that requires users to reboot the system after changing the nvpmodel power mode or otherwise experience a performance drop. **How does it impact the customer?** Performance may drop significantly after changing the nvpmodel power mode. **If there is a workaround, what is it?** Reboot the system after changing the nvpmodel power mode. **When can we expect the fix?** 6.0.9 **Is it for SDK/PDK?** SDK

Release Properties

The following table describes the release properties and software versions.

Release Properties	
Property	Description
Linux	Specifies the operating system.
20.04	Specifies the host Ubuntu operating system version.
Focal Fossa	Specifies the codename for the host version of Ubuntu.
20.04	Specifies the target root file system operating system version.
6.0.8.1	Specifies the NVIDIA release branch number.
	Specifies the build ID for the Linux operating system.
drive-linux	Specifies the product name.
Linux	Specifies the platform.
234	Specifies the architecture version.
5.15	Specifies the supported kernel version.
Software Version	
Software	Version
GCC Cross-compiler Toolchain for user applications and libraries for Yocto root file system.	9.3
GCC Cross-compiler Toolchain for user applications and libraries for Ubuntu root file system.	9.3
OpenGL ES	3.2
OpenGL: Provided for development purposes. Production systems are expected to use OpenGL ES.	4.6
Wayland	1.18
Vulkan Provided for development purposes. Safety systems are expected to use Vulkan SC.	1.3

Vulkan SC	1.0
OpenWF Display	1.0
DriveWorks	5.14
DLA	3.14.1[1]
CUDA Toolkit	11.4.24 – Reference 11.4.4 documentation
cuDNN	8.9.2
TensorRT	8.6.11
ONNX	1.9.0 and opset 13
TensorFlow	1.15.0
PyTorch	1.9.0
Elementwise	2.4.2

DRIVE OS Supported Sensors

For a list of supported sensors, see the Supported Sensors chapter under Setup and Configuration section in the *NVIDIA DRIVE OS Linux Developer Guide*. For more information, refer to the DRIVE Hyperion 8.1 Sensors and Accessories page.

CUDA

The following table describes CUDA support.

Host OS	Host OS Version	Target OS	Target OS Version	Compiler Support
Ubuntu	20.04 LTS	Ubuntu	Ubuntu 20.04	GCC 9.3

Standard

The current release label is 11.4.24. The various components in the toolkit are versioned independently. The following table shows each component and its version:

Component Name	Version Information	Supported Architectures
CUDA Runtime (cudart)	11.4. 409	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
cuobjdump	11.4. 409	Linux (aarch64), Linux (x86_64)
CUPTI	11.4. 409	Linux (aarch64), Linux (x86_64), qnx-

[1] DLA versions 1.3.7, 1.3.8, 3.9.0, and 3.10 are also supported.

		standard_aarch64
CUDA cuxxfilt (demangler)	11.4. 409	Linux (aarch64), Linux (x86_64)
CUDA Demo Suite	11.4. 409	Linux (x86_64)
CUDA GDB	11.4. 409	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA NVCC	11.4. 409	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA nvdisasm	11.4. 409	Linux (aarch64), Linux (x86_64)
CUDA NVML Headers	11.4. 409	Linux (aarch64), Linux (x86_64)
CUDA nvprof	11.4. 409	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA nvprune	11.4. 409	Linux (aarch64), Linux (x86_64)
CUDA NVRTC	11.4. 409	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA NVTX	11.4. 409	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA NVVP	11.4. 409	Linux (x86_64)
CUDA Samples	11.4. 409	l4t_aarch64, Linux (aarch64), Linux (x86_64)
CUDA Compute Sanitizer API	11.4. 409	Linux (aarch64), Linux (x86_64)
CUDA Thrust	11.4. 409	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA cuBLAS	11.6.6.193	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA cuDLA	11.4. 409	Linux (aarch64), qnx-standard_aarch64
CUDA cuFFT	10.6.0.313	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA cuRAND	10.2.5.408	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA cuSOLVER	11.2.0.408	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA cuSPARSE	11.6.0.408	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
CUDA NPP	11.4.0.398	Linux (aarch64), Linux (x86_64), qnx-standard_aarch64
Nsight Compute	2021.2.10.1	Linux (x86_64), qnx-standard_aarch64
NVIDIA Linux Driver	470.182.03	Linux (x86_64)

Notice

The information provided in this specification is believed to be accurate and reliable as of the date provided. However, NVIDIA Corporation (“NVIDIA”) does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information. NVIDIA shall have no liability for the consequences or use of such information or for any infringement of patents or other rights of third parties that may result from its use. This publication supersedes and replaces all other specifications for the product that may have been previously supplied.

NVIDIA reserves the right to make corrections, modifications, enhancements, improvements, and other changes to this specification, at any time and/or to discontinue any product or service without notice. Customer should obtain the latest relevant specification before placing orders and should verify that such information is current and complete.

NVIDIA products are sold subject to the NVIDIA standard terms and conditions of sale supplied at the time of order acknowledgement, unless otherwise agreed in an individual sales agreement signed by authorized representatives of NVIDIA and customer. NVIDIA hereby expressly objects to applying any customer general terms and conditions with regards to the purchase of the NVIDIA product referenced in this specification.

NVIDIA products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of the NVIDIA product can reasonably be expected to result in personal injury, death or property or environmental damage. NVIDIA accepts no liability for inclusion and/or use of NVIDIA products in such equipment or applications and therefore such inclusion and/or use is at customer’s own risk.

NVIDIA makes no representation or warranty that products based on these specifications will be suitable for any specified use without further testing or modification. Testing of all parameters of each product is not necessarily performed by NVIDIA. It is customer’s sole responsibility to ensure the product is suitable and fit for the application planned by customer and to do the necessary testing for the application in order to avoid a default of the application or the product. Weaknesses in customer’s product designs may affect the quality and reliability of the NVIDIA product and may result in additional or different conditions and/or requirements beyond those contained in this specification. NVIDIA does not accept any liability related to any default, damage, costs or problem which may be based on or attributable to: (i) the use of the NVIDIA product in any manner that is contrary to this specification, or (ii) customer product designs.

No license, either expressed or implied, is granted under any NVIDIA patent right, copyright, or other NVIDIA intellectual property right under this specification. Information published by NVIDIA regarding third-party products or services does not constitute a license from NVIDIA to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property rights of the third party, or a license from NVIDIA under the patents or other intellectual property rights of NVIDIA. Reproduction of information in this specification is permissible only if reproduction is approved by NVIDIA in writing, is reproduced without alteration, and is accompanied by all associated conditions, limitations, and notices.

ALL NVIDIA DESIGN SPECIFICATIONS, REFERENCE BOARDS, FILES, DRAWINGS, DIAGNOSTICS, LISTS, AND OTHER DOCUMENTS (TOGETHER AND SEPARATELY, “MATERIALS”) ARE BEING PROVIDED “AS IS.” NVIDIA MAKES NO WARRANTIES, EXPRESSED, IMPLIED, STATUTORY, OR OTHERWISE WITH RESPECT TO THE MATERIALS, AND EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. Notwithstanding any damages that customer might incur for any reason whatsoever, NVIDIA’s aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the NVIDIA terms and conditions of sale for the product.

VESA DisplayPort

DisplayPort and DisplayPort Compliance Logo, DisplayPort Compliance Logo for Dual-mode Sources, and DisplayPort Compliance Logo for Active Cables are trademarks owned by the Video Electronics Standards Association in the United States and other countries.

HDMI

HDMI, the HDMI logo, and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

OpenCL

OpenCL is a trademark of Apple Inc. used under license to the Khronos Group Inc.

Blackberry

BLACKBERRY, EMBLEM Design, QNX, AVIAGE, MOMENTICS, NEUTRINO and QNX CAR are the trademarks or registered trademarks of BlackBerry Limited, used under license, and the exclusive rights to such trademarks are expressly reserved.

Trademarks

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

Copyright