NVIDIA Data Center GPU Driver version 525.85.12 (Linux)/ 528.31 (Windows)

Release Notes

RN-08625-525 _v2.0 | January 2023

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Chapter 1. Version Highlights

This section provides highlights of the NVIDIA Data Center GPU R525 Driver (version 525.85.12 Linux and 528.33 Windows).

For changes related to the 525 release of the NVIDIA display driver, review the file "NVIDIA_Changelog" available in the .run installer packages.

- Linux driver release date: 01/30/2023
- Windows driver release date: 01/30/2023

1.1. Software Versions

For this release, the software versions are as follows:

- CUDA Toolkit 12: 12.0 Update 1

  Note that starting with CUDA 11, individual components of the toolkit are versioned independently. For a full list of the individual versioned components (for example, nvcc, CUDA libraries, and so on), see the CUDA Toolkit Release Notes.
- NVIDIA Data Center GPU Driver: 525.85.12 (Linux) / 528.33 (Windows)
- Fabric Manager: 525.85.12 (Use `nv-fabricmanager -v`)
- GPU VBIOS:
  - HGX H100 PG520 SKU200
    - 96.00.51.00.0B
  - HGX A100 PG506
    - 92.00.45.00.03 SKU200 40GB air cooling (lidless)
    - 92.00.45.00.04 SKU202 40GB hybrid cooling (lidded)
    - 92.00.45.00.05 SKU210 80GB air cooling (lidless)
    - 92.00.45.00.06 SKU212 80GB hybrid cooling (lidded)
  - HGX A100 PG510
    - 92.00.81.00.01 SKU200 40GB air cooling (lidless)
    - 92.00.81.00.02 SKU202 40GB hybrid cooling (lidded)

        - 92.00.81.00.04 SKU210 80GB air cooling (lidless)
        - 92.00.81.00.05 SKU212 80GB hybrid cooling (lidded)
    - HGX A800 PG506
        - 92.00.A4.00.01 SKU215 80GB air cooling (lidless)
    - HGX A800 PG510
        - 92.00.A4.00.05 SKU215 80GB air cooling (lidless)
    - A100 PCIe P1001 SKU230
        - 92.00.90.00.04 (NVIDIA A100 PCIe)
    - A800 PCIe P1001
        - 92.00.A4.00.0D 80 GB SKU235 PCIe
- NVSwitch VBIOS: 92.10.14.00.01
- NVFlash: 5.791

For more information on getting started with the NVIDIA Fabric Manager on NVSwitch-based systems (for example, NVIDIA HGX A100), refer to the Fabric Manager User Guide.

1.2. Known Issues

General

- For some SKUs of GH100 the MIG profile name reported by `cuDeviceGetName`, particularly the number of compute instances, might be incorrect. Use `nvidia-smi` to query the actual loaded MIG profile names. Only `cuDeviceGetName` is affected; developers are recommended to query the precise SM information for precise configuration. This will be fixed in a subsequent driver release.
- "Change ECC State" and "Enable Error Correction Code" do not change synchronously when ECC state changes.
- The GPU driver build system might not pick the `Module.symvers` file, produced when building the `ofa_kernel` module from MLNX_OFED, from the right subdirectory. Because of that, `nvidia_peermem.ko` does not have the right kernel symbol versions for the APIs exported by the IB core driver, and therefore it does not load correctly. That happens when using MLNX_OFED 5.5 or newer on a Linux Arm64 or ppc64le platform.

  To work around this issue, perform the following:

  1. Verify that nvidia_peermem.ko does not load correctly.
  2. Uninstall old MLNX_OFED if one was installed.
  3. Manually remove `/usr/src/ofa_kernel/default` if one exists.

4. Install MLNX_OFED 5.5 or newer.
5. Manually create a soft link:
   ```
   /usr/src/ofa_kernel/default -> /usr/src/ofa_kernel/$(uname -m)/$(uname -r)
   ```
6. Reinstall the GPU driver.

- If you encounter an error on RHEL7 when installing with `cuda-drivers-fabricmanager` packages, use the following alternate instructions. For example:

  If you are upgrading from a different branch, for example to driver 515.65.01:

  ```
  new_version=515.65.01
  sudo yum swap nvidia-driver-latest-dkms nvidia-driver-latest-dkms-${new_version}
  sudo yum install nvidia-fabric-manager-${new_version}
  ```

- When installing a driver on SLES15 or openSUSE15 that previously had an R515 driver installed, users need to run the following command afterwards to finalize the installation:

  ```
  sudo zypper install --force nvidia-gfxG05-kmp-default
  ```

  Without doing this, users may see the kernel objects as missing.

- `nvidia-release-upgrade` may report that not all updates have been installed and exit.

  When running the `nvidia-release-upgrade` command on DGX systems running DGX OS 4.99.x, it may exit and tell users: "Please install all available updates for your release before upgrading" even though all upgrades have been installed.

  Users who see this can run the following command:

  ```
  sudo apt install -y nvidia-fabricmanager-450/bionic-updates --
  allow-downgrades
  ```

  After running this, proceed with the regular upgrade steps:

  ```
  sudo apt update
  sudo apt full-upgrade -y
  sudo apt install -y nvidia-release-upgrade
  sudo nvidia-release-upgrade
  ```

- By default, Fabric Manager runs as a `systemd` service. If using `DAEMONIZE=0` in the Fabric Manager configuration file, then the following steps may be required.

  1. Disable FM service from auto starting.
     ```
     systemctl disable nvidia-fabricmanager
     ```
  2. Once the system is booted, manually start FM process.
     ```
     /usr/bin/nv-fabricmanager -c /usr/share/nvidia/nvswitch/fabricmanager.cfg
     ```
     Note, since the process is not a daemon, the SSH/Shell prompt will not be returned (use another SSH shell for other activities or run FM as a background task).

- **Important correctness fix for H100 GPU instructions used by cuBLAS, other CUDA libraries, and user CUDA code**

An issue was discovered recently with H100 GPUs (H100 PCIe and HGX H100) where certain operations put the GPU in an invalid state that allowed some GPU instructions to operate at unsupported frequency that can result in incorrect computation results and faster than expected performance. The affected GPU instructions are used by cuBLAS, other CUDA libraries, and can also be used for user CUDA code.

The operations that allow the GPU to enter an invalid state are the following:

- Enabling MIG
- Deinitialize and reinitialize the GPU (for example, turn off persistence mode and turn it back on or reload the nvidia.ko driver)
- Any Compute Engine error (for example, MMU fault, Out of Range warp error, and so on)

Once the GPU enters the invalid state, the performance for some GPU instructions is increased by 7-10%, but the **computation results may be incorrect**.

The current release fixes this issue, and it is no longer possible to enter the invalid GPU state. This issue has been present in all drivers since the H100 launch, and we recommend that you upgrade to the current release as soon as possible. If upgrading is not immediately possible, a GPU reset can restore the GPU back to the correct operational state, except for when MIG is being used. For MIG, the new driver is required, and there is no workaround available.

- **Uninstalling the driver fails, and the system reboots automatically.**

  On Windows 2019 and 2022 servers, uninstalling the driver causes the system to restart automatically before the uninstallation is completed. The issue also occurs when you upgrade the driver from an older version to a new version, even after selecting the **Perform Clean Installation** option in the installer UI.

  

  Note: This issue does not occur in Linux.

  Workaround

  We strongly recommend that you **always** install, uninstall, and upgrade drivers from Safe mode.

- **Capability bits should be reset to default if the RM/PMU SMBPBI is unresponsive.**

  If the PMU becomes unresponsive, the SMBPBI server switches to the autonomous `driver not loaded` mode. This transition is typically reflected in the capability bit and by posting the appropriate event, but this is not currently happening. Due to this issue, HMC SMBPBI refresh intervals get impacted and the power and thermal uris will start showing stale readings.

  Workaround

  Reboot of Baseboard.

- **In Shared Switch virtualization mode, the guest VM GPU driver load and unload stress test fails after certain iteration**

  In the Shared Switch virtualization mode, the stress test to load and unload the GPU driver on Guest VM in every 30 second interval runs into issues approximately after three hours of the test.

  Workaround

  Do not run the stress reload driver cycle at this time.

- **A few Async SMBPBI commands do not function as intended when the driver is unloaded.**

  When the driver is unloaded, the following Async SMBPBI commands do not operate as specified:

  - Arg1 0x00: Reads total GPU power limit control data.
  - Arg1 0x01: Sets the total GPU power limit.
  - Arg1 0x02: Reads the total GPU power limit policy information.

  Due to this issue, some properties of the following Redfish URIs are impacted:

  - **PowerLimitWatts.SetPoint:**

    `/redfish/v1/Systems/HGX_Baseboard_0/Processors/GPU_SXM_[1-8]/EnvironmentMetrics`

  - **SpeedLimitMHz, SpeedLocked:**

    `/redfish/v1/Systems/HGX_Baseboard_0/Processors/GPU_SXM_[1-8]`

  The Patch operation of the following URIs are impacted:

  - **PowerLimitWatts.SetPoint:**

    `/redfish/v1/Systems/HGX_Baseboard_0/Processors/GPU_SXM_[1-8]/EnvironmentMetrics`

  - **Oem.Nvidia.PowerMode "MaxP" or "MaxQ":**

    `/redfish/v1/Chassis/HGX_Chassis_0/EnvironmentMetrics`

  - **SpeedLimitMHz, SpeedLocked:**

    `/redfish/v1/Systems/HGX_Baseboard_0/Processors/GPU_SXM_[1-8]`

  Workaround

  Load the driver for these URIs to work properly.

- **Fabric Manager state is not reported accurately on NVSwitch OOB query**

  The NVSwitch SMPBI query that reports Fabric Manager state (Manager State) is not reporting the actual FM state.

- **Instructions to reset all GPUs Using the nvidia-smi -r Command**

When resetting all GPUs using the `nvidia-smi` command with the `-r` option instead of a resetting specific GPU using the `-i <gpu_index>` option, all the NVSwitches will also be reset. This process wipes out the NVSwitch routing entries, and subsequent CUDA application launches will fail. The Fabric Manager service will also show interaction errors with the NVSwitch device via the switch driver.

Workaround

1. Stop the Fabric Manager service.
2. To reset all GPUs, run `nvidia-smi -r`.
3. After the reset is finished, start the Fabric Manager service.

GPU Performance Counters

The use of developer tools from NVIDIA that access various performance counters requires administrator privileges. See this note for more details. For example, reading NVLink utilization metrics from `nvidia-smi (nvidia-smi nvlink -g 0)` would require administrator privileges.

NoScanout Mode

NoScanout mode is no longer supported on NVIDIA Data Center GPU products. If NoScanout mode was previously used, then the following line in the "screen" section of /etc/X11/xorg.conf should be removed to ensure that X server starts on data center products:

```
Option         "UseDisplayDevice" "None"
```

NVIDIA Data Center GPU products now support one display of up to 4K resolution.

Unified Memory Support

CUDA and unified memory is not supported when used with Linux power management states S3/S4.

IMPU FRU for Volta GPUs

The driver does not support the IPMI FRU multi-record information structure for NVLink. See the Design Guide for Tesla P100 and Tesla V100-SXM2 for more information.

OpenCL 3.0 Known Issues

Device side enqueue

- Device-Side-Enqueue related queries may return 0 values, although corresponding built-ins can be safely used by kernel. This is in accordance with conformance requirements described at https://www.khronos.org/registry/OpenCL/specs/3.0-unified/html/OpenCL_API.html#opencl-3.0-backwardscompatibility
- Shared virtual memory - the current implementation of shared virtual memory is limited to 64-bit platforms only.

Chapter 2. Virtualization

To make use of GPU passthrough with virtual machines running Windows and Linux, the hardware platform must support the following features:

- A CPU with hardware-assisted instruction set virtualization: Intel VT-x or AMD-V.
- Platform support for I/O DMA remapping.
- On Intel platforms, the DMA remapper technology is called Intel VT-d.
- On AMD platforms, it is called AMD IOMMU.

Support for these features varies by processor family, product, and system, and should be verified at the manufacturer's website.

Supported Hypervisors

The following hypervisors are supported:

Hypervisor	Notes
Citrix XenServer	Version 6.0 and later
VMware vSphere (ESX / ESXi)	Version 5.1 and later.
Red Hat KVM	Red Hat Enterprise Linux 7 with KVM
Microsoft Hyper-V	Windows Server 2016 Hyper-V Generation 2 Windows Server 2012 R2 Hyper-V

Data Center products now support one display of up to 4K resolution.

Supported Graphics Cards

The following GPUs are supported for device passthrough:

GPU Family	Boards Supported
NVIDIA Ada Lovelace	NVIDIA L40
NVIDIA Hopper	NVIDIA H100 PCIe (x86 and ARM)
NVIDIA Ampere GPU Architecture	NVIDIA A800, A100, A40, A30, A16, A10
NVIDIA Turing	NVIDIA T4

GPU Family	Boards Supported
NVIDIA Volta	NVIDIA V100
NVIDIA Pascal	Quadro: P2000, P4000, P5000, P6000, GP100
	Tesla: P100, P40, P4
NVIDIA Maxwell	Quadro: K2200, M2000, M4000, M5000, M6000, M6000 24GB
	Tesla: M60, M40, M6, M4

Chapter 3. Hardware and Software Support

Support for these features varies by processor family, product, and system, and should be verified at the manufacturer's website.

Supported Operating Systems for NVIDIA Data Center GPUs

The Release 525 driver is supported on the following operating systems:

- Windows x86_64 operating systems:
  - Microsoft Windows® Server 2022
  - Microsoft Windows® Server 2019
  - Microsoft Windows® Server 2016

    Note: R525TeslaRD will be the last TRD to support Server 2016.
  - Microsoft Windows® 11 21H2
  - Microsoft Windows® 11 22H2 - SV2
  - Microsoft Windows® 10
- The following table summarizes the supported Linux 64-bit distributions. For a complete list of distributions, kernel versions supported, see the CUDA Linux System Requirements documentation.

Distribution	x86_64	POWER	Arm64 Server
Debian 11.x (where x <= 6)	Yes	No	No
Debian 10. x (where x <= 13)	Yes	No	No
OpenSUSE Leap 15.x (where y <= 4)	Yes	No	No
Fedora 37	Yes	No	No
Red Hat Enterprise Linux 9.1	Yes	No	Yes

Distribution	x86_64	POWER	Arm64 Server
Rocky Linux 9.1	Yes	No	No
Red Hat Enterprise Linux 8.y (where y <= 7)	Yes	Yes	Yes
Rocky Linux 8.y (where y <= 7)	Yes	No	No
Red Hat Enterprise Linux / CentOS 7.y (where y <= 9)	Yes	No	No
SUSE Linux Enterprise Server 15.y (where y <= 4)	Yes	No	Yes
Ubuntu 22.04.z LTS (where z <= 1)	Yes	No	Yes
Ubuntu 20.04.z LTS (where z <= 5)	Yes	No	Yes
Ubuntu 18.04.z LTS (where z <= 6)	Yes	No	No
KylinOS V10 SP2	Yes	No	No

Supported Operating Systems and CPU Configurations for NVIDIA HGX H100

The Release 525 driver is validated with NVIDIA HGX H100 on the following operating systems and CPU configurations:

- Linux 64-bit distributions:
  - Red Hat Enterprise Linux 8.7 (in 4/8/16-GPU configurations)
  - Red Hat Enterprise Linux 9.1 (in 4/8/16-GPU configurations)
  - Ubuntu 22.04.1 LTS (in 4/8/16-GPU configurations)
- Windows 64-bit distributions:
  - Windows Server 2022
  - Windows Server 2019 (in 1/2/4/8-GPU configurations; 16-GPU configurations are currently not supported)

    Windows is supported only in shared NVSwitch virtualization configurations.

Supported Operating Systems and CPU Configurations for NVIDIA HGX A100

The Release 525 driver is validated with NVIDIA HGX A100 on the following operating systems and CPU configurations:

- Linux 64-bit distributions:
  - Debian 11.6
  - Debian 10.13
  - Red Hat Enterprise Linux 8.7 (in 4/8/16-GPU configurations)
  - Red Hat Enterprise Linux 7.9 (in 4/8/16-GPU configurations)
  - Rocky Linux 8.7 (in 4/8/16-GPU configurations)
  - Red Hat Enterprise Linux 9.1 (in 4/8/16-GPU configurations)
  - CentOS Linux 7.9 (in 4/8/16-GPU configurations)
  - Ubuntu 22.04.1 LTS (in 4/8/16-GPU configurations)
  - Ubuntu 20.04.5 LTS (in 4/8/16-GPU configurations)
  - Ubuntu 18.04.6 LTS (in 4/8/16-GPU configurations)
  - SUSE SLES 15.4 (in 4/8/16-GPU configurations)
  - KylinOS V10 SP2
- Windows 64-bit distributions:
  - Windows Server 2022
  - Windows Server 2019 (in 1/2/4/8-GPU configurations; 16-GPU configurations are currently not supported)

    Windows is supported only in shared NVSwitch virtualization configurations.
- CPU Configurations:
  - AMD Rome in PCIe Gen4 mode
  - Intel Skylake/Cascade Lake (4-socket) in PCIe Gen3 mode

Supported Virtualization Configurations

The Release 525 driver is validated with NVIDIA HGX A100 and HGX A800 on the following configurations:

- Passthrough (full visibility of GPUs and NVSwitches to guest VMs):
  - 8-GPU configurations with Ubuntu 18.04.6 LTS, 20.4.5, and 22.4.1
- Shared NVSwitch (guest VMs only have visibility of GPUs and full NVLink bandwidth between GPUs in the same guest VM):
  - 1/2/4/8/16-GPU configurations with Ubuntu 18.04.5 LTS

API Support

This release supports the following APIs:

- NVIDIA® CUDA® 12.0 for NVIDIA® Maxwell™, Pascal™, Volta™, Turing™, Hopper™, NVIDIA Ampere architecture, and NVIDIA Ada Lovelace GPU architecture GPUs

- OpenGL® 4.6
- Vulkan® 1.3
- DirectX 11
- DirectX 12 (Windows 10)
- Open Computing Language (OpenCL™ software) 3.0

Note that for using graphics APIs on Windows (such as OpenGL, Vulkan, DirectX 11, and DirectX 12) or any WDDM 2.0+ based functionality on Data Center GPUs, vGPU is required. See the vGPU documentation for more information.

Supported NVIDIA Data Center GPUs

The NVIDIA Data Center GPU driver package is designed for systems that have one or more Data Center GPU products installed. This release of the driver supports CUDA C/C++ applications and libraries that rely on the CUDA C Runtime and/or CUDA Driver API.

Attention: Release 470 was the last driver branch to support Data Center GPUs based on the NVIDIA Kepler architecture. This includes discontinued support for the following compute capabilities:

- sm_30 (NVIDIA Kepler)
- sm_32 (NVIDIA Kepler)
- sm_35 (NVIDIA Kepler)
- sm_37 (NVIDIA Kepler)

For more information on GPU products and compute capability, see https://developer.nvidia.com/cuda-gpus.

NVIDIA Server Platforms	
Product	**Architecture**
NVIDIA HGX H100	H100 and NVSwitch
NVIDIA HGX A800	A800 and NVSwitch
NVIDIA HGX A100	A100 and NVSwitch
NVIDIA HGX-2	V100 and NVSwitch

Data Center L-Series Products	
Product	**GPU Architecture**
NVIDIA L40	NVIDIA Ada Lovelace

Data Center H-Series Products	
Product	**GPU Architecture**
NVIDIA H100 PCIe	NVIDIA Hopper

RTX-Series / T-Series Products	
Product	**GPU Architecture**
NVIDIA RTX A6000	NVIDIA Ampere architecture
NVIDIA RTX A5000	NVIDIA Ampere architecture
NVIDIA RTX A4000	NVIDIA Ampere architecture
Quadro RTX 8000	NVIDIA Turing
Quadro RTX 6000	NVIDIA Turing
NVIDIA T1000	NVIDIA Turing
NVIDIA T600	NVIDIA Turing
NVIDIA T400	NVIDIA Turing

Data Center A-Series Products	
Product	**GPU Architecture**
NVIDIA A2	NVIDIA Ampere architecture
NVIDIA A800	NVIDIA Ampere architecture
NVIDIA A100X	NVIDIA Ampere architecture
NVIDIA A100 NVIDIA A100 80 GB PCIe	NVIDIA Ampere architecture
NVIDIA A40	NVIDIA Ampere architecture
NVIDIA A30. A30X	NVIDIA Ampere architecture
NVIDIA A16	NVIDIA Ampere architecture
NVIDIA A10, A10M	NVIDIA Ampere architecture

Data Center T-Series Products	
Product	**GPU Architecture**
NVIDIA T4	NVIDIA Turing

Data Center V-Series Products	
Product	**GPU Architecture**
NVIDIA V100	Volta

Data Center P-Series Products	
Product	**GPU Architecture**
NVIDIA Tesla P100	NVIDIA Pascal
NVIDIA Tesla P40	NVIDIA Pascal

Data Center P-Series Products	
Product	**GPU Architecture**
NVIDIA Tesla P4	NVIDIA Pascal

Data Center M-Class Products	
Product	**GPU Architecture**
NVIDIA Tesla M60	Maxwell
NVIDIA Tesla M40 24 GB	Maxwell
NVIDIA Tesla M40	Maxwell
NVIDIA Tesla M6	Maxwell
NVIDIA Tesla M4	Maxwell

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