



NVIDIA Data Center GPU Driver version 590.48.01 (Linux)/591.59 (Windows)

Release Notes

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Chapter 1. Version Highlights

This section provides highlights of the NVIDIA Data Center GPU R590 Driver (version 590.48.01 Linux and 591.59 Windows).

For changes related to the 590 release of the NVIDIA display driver, review the file "NVIDIA_Changelog" available in the .run installer packages.

- ▶ Linux driver release date: 12/22/2025
- ▶ Windows driver release date: 12/22/2025

1.1. Software Versions

For this release, the software versions are as follows:

- ▶ CUDA Toolkit 13: 13.x
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: 590.48.01 (Linux)/ 591.59 (Windows)
- ▶ Fabric Manager: 590.48.01 (Use `nv-fabricmanager -v`)
- ▶ 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. Fixed Issues

- ▶ Move the allocation of `migrate_vma_state_t` to use `kvmalloc()` which will fall back to a virtually contiguous allocation if a physically contiguous allocation from `kmalloc()` is not possible.
Note that on 4K kernels, because the allocation is above `UVM_KMALLOC_THRESHOLD` so `vmalloc()` will be used. On 64K kernels `kmalloc()` will be used.
- ▶ Add a check before attempting to free the NULL pointer.
- ▶ Add proper synchronization for ISINK controller code.

- ▶ ISINK XIDs are only logged when power smoothing is enabled.
- ▶ Allow the removal of GPU from the partition while the multicast team is active and correct refcnt logic to handle the scenario.
- ▶ Remove the old workaround in the NVIDIA driver to promote all spinlocks to raw spinlocks under `PREEMPT_RT`, which are no longer necessary.
- ▶ Adjust event processing to handle the other order of events being generated, so that IMEX properly cleans up and establishes new connections and data streams.

1.3. Known Issues

- ▶ Applications using `cuTensorMapEncodeTiled()` or `cuTensorMapEncodeIm2col*` on Blackwell GPUs may encounter sporadic illegal memory accesses (IMA) or MMU faults (like XID 13) due to driver incorrectly configuring TMA descriptors when the tensor's backing memory allocation is less than 128KB and it is not a dense non-overlapping tensor. To workaround this issue, add the following after descriptor creation for such tensors.

```
CUtensorMap tensorMap;
cuTensorMapEncode*(&tensorMap, ...); // Create descriptor
((uint64_t*)&tensorMap)[1] &= ~(uint64_t)1 << 21; // Workaround : clear bit 85
```

This workaround is specific to Blackwell's tensor map descriptor layout and may not be portable to future GPU architectures. It should be removed once updated drivers with the fix are deployed.

- ▶ This version of the GPU driver will fail to initialize on systems with Hopper GPUs subrevision = 3 and VBIOS versions older than 96.00.68.00.xx. Please ensure the system is using a VBIOS version 96.00.68.00.xx or newer before upgrading to this version of the driver.
- ▶ When upgrading from ClosedRM to OpenRM, `nvidia-smi` may fail.

Workaround

Run the following commands:

```
sudo rpm -e nvidia-open-driver-G06-kmp-default --nodeps
sudo zypper in nvidia-driver-G06-kmp-default
sudo zypper install -y nvidia-open-570
```

- ▶ The default TCC mode in the NVIDIA driver does not support IOMMU-based isolation (necessary for Windows features such as DMA protection, kernel DMA guard, virtualization-based security, etc.). The impacted GPUs are NVIDIA L40, NVIDIA L40S, NVIDIA L20, NVIDIA L4, and NVIDIA RTX PRO 6000 Blackwell Server Edition.
- ▶ This GPU Driver release is compatible only with Data Center GPU Manager (DCGM) versions 4.3.x or newer. Earlier versions of DCGM are not compatible.
- ▶ On RHEL 10 x86_64 with kernel 6.12.0-55.29.1.el10_0.x86_64 the `doca-ufed` package does not include the `ib_umad.ko` module, causing Fabric Manager to fail at startup. This issue is not present on the older kernel 6.12.0-55.9.1.el10_0.x86_64.
- ▶ If your environment meets all of the following conditions:
 - ▶ You are using an RPM based distribution.
 - ▶ You are not using the online CUDA package repository.

- ▶ You manually installed `nvidia-fabricmanager-devel-580.65.06-1`.

In this case, uninstall the package manually before installing the new version. This does not prevent the other driver packages from being upgraded successfully.

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.

The following hypervisors are supported for virtualization:

| 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 9 with KVM |
| Microsoft Hyper-V | Windows Server 2019 Hyper-V Generation 2 |

Data Center products now support one display of up to 2560x1600 resolution.

The following GPUs are supported for device passthrough for virtualization:

| GPU Family | Boards Supported |
|--------------------------------|--|
| NVIDIA Blackwell | NVIDIA HGX B300, NVIDIA RTX 6000D, NVIDIA H20BFX, NVIDIA RTX 6000 PRO, NVIDIA HGX GB200 NVL, NVIDIA HGX B200 |
| NVIDIA Grace Hopper | NVIDIA GH200 |
| NVIDIA Hopper | NVIDIA H100, NVIDIA H800 |
| NVIDIA Ada Lovelace | NVIDIA L40, L4, L2, L20 |
| NVIDIA Ampere GPU Architecture | NVIDIA A800, A100, A40, A30, A16, A10, A10G, A2, AX800 |

| GPU Family | Boards Supported |
|-------------------|-------------------------|
| NVIDIA Turing | NVIDIA T4, NVIDIA T4G |

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.

Coherent Driver-Based Memory Management (CDMM)

The R590 Driver introduces Coherent Driver-Based Memory Management (CDMM) for GB200 platforms. With CDMM, the driver manages GPU memory instead of the OS. CDMM avoids OS onlining of the GPU memory and the exposing of the GPU memory as a NUMA node to the OS. It is recommended that Kubernetes clusters enable CDMM to resolve potential memory over-reporting.

To set up the driver in CDMM mode, run the following commands and then reload the driver:

```
echo options nvidia NVreg_CoherentGPUMemoryMode=driver >
/etc/modprobe.d/nvidia-openrm.conf
```



Note:

1. If there is already a configuration file for the nvidia driver, please merge the options into a single options line.
2. To remove the configuration, undo its addition to the configuration file
3. To use GDRCopy with CDMM, please use version 2.5.1 or later of GDRCopy.
4. GPU Direct Storage is not supported with CDMM.

Supported Operating Systems for NVIDIA Data Center GPUs

The Release 590 driver is supported on the following operating systems:

- ▶ Windows x86_64 operating systems:
 - ▶ Microsoft Windows® Server 2025 24H2
 - ▶ Microsoft Windows® Server 2022 21H2
 - ▶ Microsoft Windows® 11 25H2

- ▶ Microsoft Windows® 11 24H2 - SV4
- ▶ Microsoft Windows® 11 23H2
- ▶ Microsoft Windows® 11 22H2 - SV2
- ▶ Microsoft Windows® 10 22H2
- ▶ 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.
- ▶ All HGX configurations support the distributions listed in the column x86_64, and all Grace configurations support the OS distributions listed in column Grace Arm64.
- ▶ The HGX platform also includes support for the Windows OS 64-bit distributions:
 - ▶ Microsoft Windows® Server 2025
 - ▶ Microsoft Windows® Server 2022
- ▶ Windows is supported only in shared NVSwitch virtualization configurations.

| Distribution | x86_64 | Arm64 Server (Generic) | NVIDIA Grace Arm64 Server |
|---|--------|------------------------|---------------------------|
| Debian 13.x (where x <= 2) | Yes | No | No |
| Debian 12.x (where x <= 12) | Yes | No | Yes |
| OpenSUSE Leap 15.x (where y = 6) | Yes | No | No |
| Fedora 42 | Yes | No | No |
| Red Hat Enterprise Linux 10.x (where x <= 1) | Yes | Yes | Yes |
| Red Hat Enterprise Linux 9.y (where y <= 7) | Yes | Yes | Yes |
| Rocky Linux 10.x (where x <= 1) | Yes | No | No |
| Rocky Linux 9.y (where y <= 7) | Yes | No | No |
| Red Hat Enterprise Linux 8.y (where y <= 10) | Yes | Yes | No |
| Rocky Linux 8.y (where y <= 10) | Yes | No | No |
| SUSE Linux Enterprise Server 15.y (where y = 6/7) | Yes | Yes | Yes |

| Distribution | x86_64 | Arm64 Server (Generic) | NVIDIA Grace Arm64 Server |
|-----------------------------------|--------|------------------------|---------------------------|
| Ubuntu 24.04.z LTS (where z <= 3) | Yes | Yes | Yes |
| Ubuntu 22.04.z LTS (where z <= 5) | Yes | Yes | Yes |
| KylinOS V10 SP3 2403 | Yes | Yes | No |
| Amazon Linux AL2023 | Yes | No | Yes |
| Microsoft Azure Linux 3.0 | Yes | No | Yes |
| Oracle Linux 8 | Yes | No | No |
| Oracle Linux 9 | Yes | No | No |

Supported Operating Systems and CPU Configurations for NVIDIA RTX 6000D

Linux 64-bit distributions:

- ▶ Debian 12.12
- ▶ Ubuntu 24.04
- ▶ Ubuntu 22.04
- ▶ RedHat Enterprise Linux 9.4

Windows 64-bit distributions:

- ▶ Microsoft Windows® Server 2025
- ▶ Microsoft Windows® 11 24H2 - SV4
- ▶ Microsoft Windows® 11 23H2 - SV3

Supported Operating Systems and CPU Configurations for NVIDIA H20 BFX

Linux 64-bit distributions:

- ▶ Ubuntu 22.04
- ▶ SUSE Linux Enterprise Server 15.6

Supported Operating Systems and CPU Configurations for NVIDIA DRIVE P2021

Linux 64-bit distributions:

- ▶ Ubuntu 24.04

Supported Operating Systems and CPU Configurations for NVIDIA RTX Pro 6000 Blackwell Server Edition

The Release 590 driver is validated with NVIDIA RTX Pro 6000 Blackwell Server Edition on the following operating systems and CPU configurations:

- ▶ Linux 64-bit distributions:
 - ▶ Debian 12.12
 - ▶ RedHat Enterprise Linux 10.1
 - ▶ RedHat Enterprise Linux 9.7
 - ▶ Rocky Linux 9.7
 - ▶ RedHat Enterprise Linux 8.10
 - ▶ OpenSUSE Leap 15.6
 - ▶ Fedora 42
 - ▶ Ubuntu 24.04
 - ▶ Ubuntu 22.04
- ▶ Windows 64-bit distributions:
 - ▶ Microsoft Windows® Server 2025
 - ▶ Microsoft Windows® 11 24H2 - SV4
 - ▶ Microsoft Windows® 11 23H2 - SV3
 - ▶ Microsoft Windows® 10 22H2
 - ▶ Microsoft Windows® 10 21H2

Supported Virtualization Configurations

The Release 590 driver is validated with NVIDIA HGX A100, HGX A800, H100, and H800 on the following configurations:

- ▶ Passthrough (full visibility of GPUs and NVSwitches to guest VMs):
 - ▶ 8-GPU configurations with Ubuntu 22.04.5

API Support

This release supports the following APIs:

- ▶ NVIDIA® CUDA® 13.x for NVIDIA® Maxwell™, Pascal™, Volta™, Turing™, Hopper™, NVIDIA Ampere architecture, NVIDIA Ada Lovelace architecture, and NVIDIA Blackwell 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 GB200 NVL | GB200 and NVLink |
| NVIDIA HGX B200 8-GPU | B200 and NVSwitch |
| NVIDIA HGX H20-3e 8-GPU | H20 and NVSwitch |
| NVIDIA HGX H20 8-GPU | H20 and NVSwitch |
| NVIDIA HGX H200 8-GPU | H200 and NVSwitch |
| NVIDIA HGX H100 8-GPU | H100 and NVSwitch |
| NVIDIA HGX H800 8-GPU | H800 and NVSwitch |
| NVIDIA HGX H100 4-GPU | H100 and NVLink |
| NVIDIA HGX A800 8-GPU | A800 and NVSwitch |
| NVIDIA HGX A100 8-GPU | A100 and NVSwitch |
| NVIDIA HGX A100 4-GPU | A100 and NVLink |

| Data Center H-Series Products | |
|--------------------------------------|-------------------------|
| Product | GPU Architecture |
| NVIDIA H100 PCIe | NVIDIA Hopper |
| NVIDIA H100 NVL | NVIDIA Hopper |
| NVIDIA H200 NVL | NVIDIA Hopper |
| NVIDIA H800 PCIe | NVIDIA Hopper |
| NVIDIA H800 NVL | NVIDIA Hopper |

| Data Center L-Series Products | |
|--------------------------------------|-------------------------|
| Product | GPU Architecture |
| NVIDIA L2 | NVIDIA Ada Lovelace |
| NVIDIA L20 | NVIDIA Ada Lovelace |
| NVIDIA L40 | NVIDIA Ada Lovelace |
| NVIDIA L40S | NVIDIA Ada Lovelace |
| NVIDIA L4 | NVIDIA Ada Lovelace |

| RTX-Series / T-Series Products | |
|---|-------------------------|
| Product | GPU Architecture |
| NVIDIA RTX PRO 6000 Blackwell Server Edition | NVIDIA Blackwell |
| NVIDIA RTX PRO 6000 Blackwell Workstation Edition | NVIDIA Blackwell |
| NVIDIA RTX PRO 6000 Blackwell Max-Q Workstation Edition | NVIDIA Blackwell |
| NVIDIA RTX PRO 5000 Blackwell | NVIDIA Blackwell |
| NVIDIA RTX PRO 4500 Blackwell | NVIDIA Blackwell |
| NVIDIA RTX PRO 4000 Blackwell | NVIDIA Blackwell |
| NVIDIA RTX PRO 2000 Blackwell | NVIDIA Blackwell |
| NVIDIA RTX PRO 4000 SFF Blackwell | NVIDIA Blackwell |
| NVIDIA RTX 6000 Ada Generation | NVIDIA Ada Lovelace |
| NVIDIA RTX 5880 Ada Generation | NVIDIA Ada Lovelace |
| NVIDIA RTX 5000 Ada Generation | NVIDIA Ada Lovelace |
| NVIDIA RTX 4500 Ada Generation | NVIDIA Ada Lovelace |
| NVIDIA RTX 4000 Ada Generation | NVIDIA Ada Lovelace |
| NVIDIA RTX 4000 SFF Ada Generation | NVIDIA Ada Lovelace |

| RTX-Series / T-Series Products | |
|---------------------------------------|----------------------------|
| Product | GPU Architecture |
| NVIDIA RTX 2000 Ada Generation | NVIDIA Ada Lovelace |
| NVIDIA RTX 2000E Ada Generation | NVIDIA Ada Lovelace |
| NVIDIA RTX A6000 | NVIDIA Ampere architecture |
| NVIDIA RTX A5500 | NVIDIA Ampere architecture |
| NVIDIA RTX A5000 | NVIDIA Ampere architecture |
| NVIDIA RTX A4500 | NVIDIA Ampere architecture |
| NVIDIA RTX A4000H | NVIDIA Ampere architecture |
| NVIDIA RTX A4000 | NVIDIA Ampere architecture |
| NVIDIA RTX A2000 12GB | NVIDIA Ampere architecture |
| NVIDIA RTX A2000 | NVIDIA Ampere architecture |
| NVIDIA RTX A1000 | NVIDIA Ampere architecture |
| NVIDIA RTX A400 | NVIDIA Ampere architecture |
| NVIDIA RTX A800 40GB Active | NVIDIA Ampere architecture |
| Quadro RTX 8000 | NVIDIA Turing |
| Quadro RTX 6000 | NVIDIA Turing |
| Quadro RTX A6000 | NVIDIA Turing |
| Quadro RTX 5000 | NVIDIA Turing |
| Quadro RTX A5000 | NVIDIA Turing |
| Quadro RTX 4000 | NVIDIA Turing |
| Quadro RTX A4000 | NVIDIA Turing |
| NVIDIA T1000 8GB | NVIDIA Turing |
| NVIDIA T600 | NVIDIA Turing |
| NVIDIA T400 4GB | NVIDIA Turing |
| NVIDIA T400 | NVIDIA Turing |
| NVIDIA T400E | NVIDIA Turing |

| Data Center A-Series Products | |
|--------------------------------------|----------------------------|
| Product | GPU Architecture |
| NVIDIA A2 | NVIDIA Ampere architecture |
| NVIDIA A800, AX800 | NVIDIA Ampere architecture |
| NVIDIA A100X | NVIDIA Ampere architecture |
| NVIDIA A100 | NVIDIA Ampere architecture |

| Data Center A-Series Products | |
|--------------------------------------|----------------------------|
| Product | GPU Architecture |
| NVIDIA A100 80 GB PCIe | |
| NVIDIA A40 | NVIDIA Ampere architecture |
| NVIDIA A30, A30X | NVIDIA Ampere architecture |
| NVIDIA A16 | NVIDIA Ampere architecture |
| NVIDIA A10, A10M, A10G | NVIDIA Ampere architecture |

| Data Center T-Series Products | |
|--------------------------------------|-------------------------|
| Product | GPU Architecture |
| NVIDIA T4, T4G | NVIDIA Turing |

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