



NVIDIA GPUDirect Storage Filesystem Kernel Driver (nvidia-fs)

Release v2.30

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Chapter 1. NVIDIA GPUDirect Storage Filesystem Kernel Driver (nvidia-fs)

Release and usage information for the NVIDIA® Magnum IO GPUDirect® Storage (GDS) filesystem kernel driver, `nvidia-fs`.

Chapter 2. Overview

The GPUDirect Storage kernel driver, `nvidia-fs.ko`, is a kernel module that orchestrates I/O directly from DMA/RDMA-capable storage to user-allocated GPU memory on NVIDIA data-center class GPUs.

For more details on using GPUDirect Storage, refer to [GPUDirect Storage](#). The GDS documents and online resources provide additional context for the optimal use and understanding of GPUDirect Storage.

Chapter 3. Release Information

This page tracks `nvidia-fs` driver releases only. The latest published `nvidia-fs` driver version is 2.30.

The driver is available through the following official distribution channel:

- [NVIDIA `nvidia-fs` installer page](#)

For the authoritative release history, refer to the [ChangeLog](#). Driver releases and source are available at [gds-nvidia-fs releases](#).

Chapter 4. Key Features

The driver supports the following storage solutions:

- ▶ NVMe and NVMe over Fabrics (NVMe-oF) block storage
- ▶ EXT4 in ordered mode on NVMe and NVMe-oF
- ▶ XFS on NVMe and NVMe-oF
- ▶ NFS over RDMA with MOFED 5.1 and later
- ▶ RDMA-capable distributed file systems, including DDN EXAScaler, WekaFS, VAST, IBM Spectrum Scale, and BeeGFS

Chapter 5. Version History

Refer to the ChangeLog file that is included in the package for more information.

Chapter 6. Known Limitations

The following limitations are specific to the `nvidia-fs` driver:

- ▶ Version 2.17.5 and later requires the NVIDIA UNIX Open Kernel Module on `x86_64`.
- ▶ Kernel compatibility depends on the `nvidia-fs` version.
- ▶ `nvidia-fs` must be rebuilt or reinstalled after an NVIDIA driver upgrade that changes exported P2P symbols.
- ▶ For NVMe deployments that use `nvidia-fs`, DOCA 3.3.x is not supported. Use DOCA 3.2.x or earlier.
- ▶ The module requires a storage or filesystem driver that implements the corresponding `nvidia-fs` callback integration.

Chapter 7. Getting Started

7.1. Hardware Requirements

- ▶ A supported NVIDIA data-center class GPU with compute capability 6.0 or later.
- ▶ An NVMe or NVMe-oF device, or a supported distributed filesystem with `nvidia-fs` integration.

7.2. Software Requirements

- ▶ NVIDIA open kernel driver 535 or later.
- ▶ CUDA Toolkit 12.2 or later as a packaging and build prerequisite.
- ▶ DOCA 3.2.x/MOFED 25.10 or later for NVMe, NVMe-oF, and NFS support.

The following table lists the minimum kernel version for each supported operating system distribution.

Table 7.1: Minimum Kernel Versions

Operating System Distribution	Minimum Kernel Version
Red Hat Enterprise Linux	4.18.0-477
Rocky Linux	4.18.0-477
Ubuntu	5.15.0-67

7.3. Installation

7.3.1. Install NVIDIA Open Source Driver

To install the open kernel module flavor, follow the instructions in the [NVIDIA Driver Installation Guide](#). Install the NVIDIA driver before you install `nvidia-fs`. When the NVIDIA driver is subsequently upgraded, DKMS automatically rebuilds `nvidia-fs`.

7.3.2. Verify NVIDIA Driver

To verify that the NVIDIA Open Kernel Module driver is installed and loaded, run the following command:

```
$ cat /proc/driver/nvidia/version
```

On a system with the Open Kernel Module flavor, you should see output that is similar to the following:

```
NVRM version: NVIDIA Open Kernel Module ...  
GCC version: gcc version 13.3.0
```

7.3.3. Install nvidia-fs

Follow the instructions on the [nvidia-fs download page](#).

7.3.4. Verify nvidia-fs

After the package is installed, load the driver if it is not already present:

```
$ sudo modprobe nvidia_fs
```

To check that the driver is present, run the following command:

```
$ lsmod | grep nvidia_fs  
nvidia_fs          274432  0  
nvidia            16388096  8 nvidia_uvm,nvidia_fs,nvidia_modeset
```

To inspect the installed module metadata, run the following command:

```
$ modinfo nvidia_fs
```

Enable the peer-affinity counters only while you diagnose topology, and then inspect the affinity and distance tables:

```
$ echo 1 | sudo tee /sys/module/nvidia_fs/parameters/peer_stats_enabled  
$ cat /proc/driver/nvidia-fs/peer_affinity  
$ cat /proc/driver/nvidia-fs/peer_distance
```

To reset the driver counters, run the following command:

```
$ echo 1 | sudo tee /proc/driver/nvidia-fs/stats
```

Read and write counters are disabled by default because they can affect small-I/O performance. To check or disable these counters, run the following commands:

```
$ cat /sys/module/nvidia_fs/parameters/rw_stats_enabled  
$ echo 0 | sudo tee /sys/module/nvidia_fs/parameters/rw_stats_enabled
```

Chapter 8. Additional Package Availability Notes

- ▶ Starting with CUDA 13.4, `nvidia-fs` is released separately and is no longer included in the CUDA runfile or CUDA local repository.
- ▶ In the CUDA network repository, `nvidia-fs` remains available as a dependency of the `nvidia-gds` meta-package. For installs that also use `packages.nvidia.com`, users can enable multiple repositories; `apt`, `dnf`, and `zypper` resolve dependencies across the union of enabled repos. Until `nvidia-fs` is backfilled there, keep the CUDA repo enabled alongside `packages.nvidia.com` when installing `nvidia-gds`.
- ▶ For local repository, the `nvidia-fs` local repository package is provided separately from the CUDA local repository package. **Both repositories must be available for the `nvidia-gds` meta-package dependencies to be resolved.**

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