

NVIDIA Data Center Drivers

Release 620

NVIDIA Corporation

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This guide describes the drivers required for NVIDIA® data-center GPUs and outlines how they integrate with the CUDA® software stack. It covers the driver lifecycle, branch types (New Feature, Production, Long-Term Support), supported driver/Toolkit versions, and the software-deployment workflow for enterprise and high-performance computing systems.

Chapter 1. Introduction

The NVIDIA compute software “stack” consists of various software products in the system software or infrastructure that are required to bootstrap a system with NVIDIA GPUs and be able to run accelerated AI or HPC workloads. A software architecture diagram of CUDA and associated components is shown below for reference:

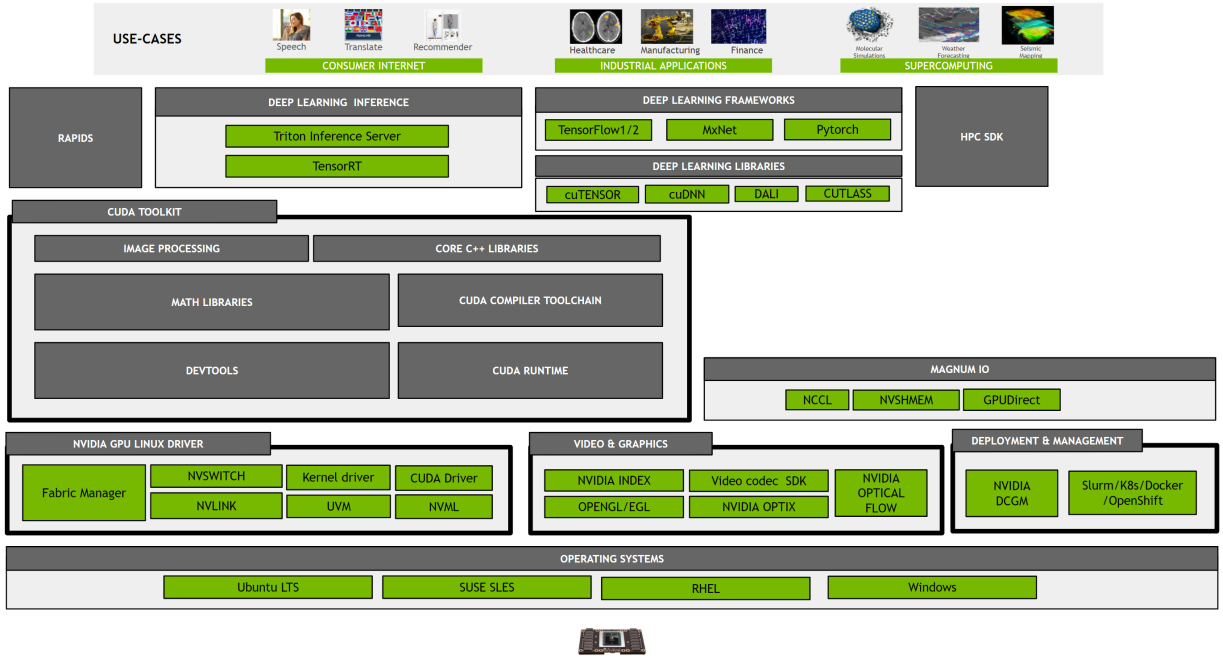


Figure 1: Overview of CUDA Toolkit and Associated Products

While NVIDIA provides a very rich software platform including SDKs, frameworks and applications, the focus of this document is on drivers, CUDA Toolkit, and the Deep Learning libraries.

Chapter 2. Driver Lifecycle

2.1. Driver Branches

Starting in 2019, NVIDIA has introduced a new enterprise software lifecycle for data center GPU drivers.

2.1.1. New Feature Branch

Major feature release, indicated by a new branch X number. This is targeted towards early adopters who want to evaluate new features (for example, new CUDA APIs). Note that these drivers may also be shipped along with CUDA Toolkit installer packages in some cases.

Release cadence: New driver branch is released approximately every quarter.

2.1.2. Production Branch

Branch that is qualified for use in production for enterprise/data center GPUs. Bug fixes and security updates are provided for up to 1 year.

Release cadence: Two driver branches are released per year (approximately every six months)

Note that during the lifetime of a production branch, bug fixes and security updates are released as needed.

2.1.3. Long Term Support Branch

A production branch that will be supported and maintained for a much longer time than a normal production branch is supported. Every LTSB is a production branch, but not every production branch is an LTSB.

Customers who are looking for a longer cycle of support from their deployed branch will gain that support through LTSB releases. LTSB releases will receive bug updates and critical security updates, on a reasonable effort basis, through minor releases during the 3 years that they are supported.

2.2. Comparison of Driver Branches

The following table summarizes the differences between the various driver branches.

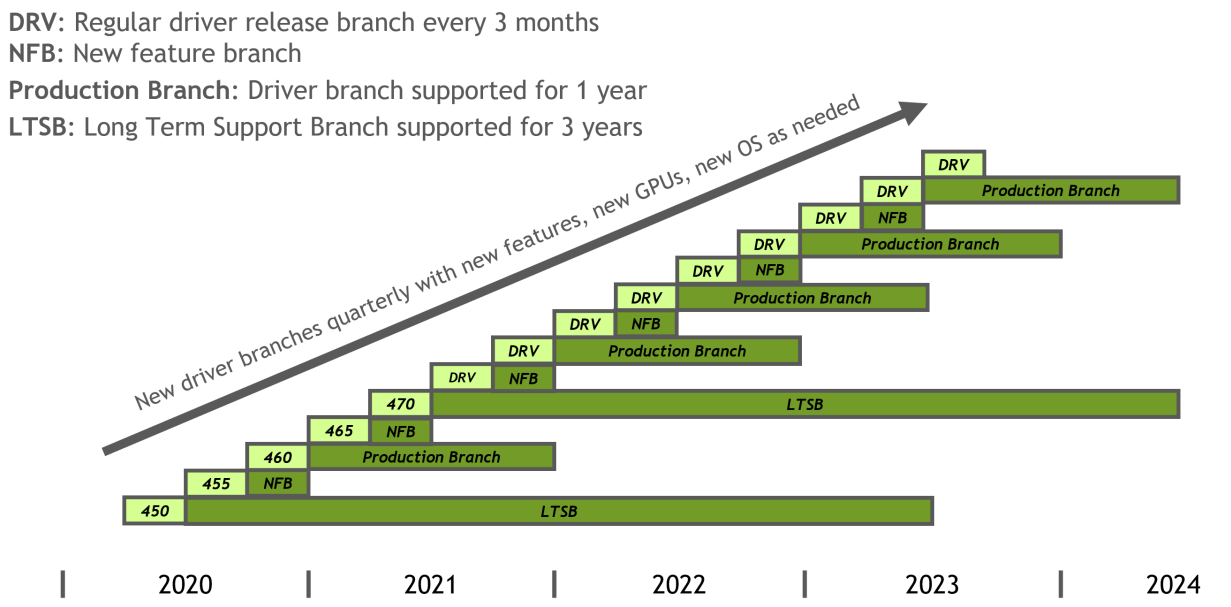


Figure 2: Taxonomy of NVIDIA Driver Branches (for illustration purposes only–see note below)

Table 1: NVIDIA Driver Branches

	New Feature Branch (NFB)	Production Branch (PB)	Long Term Support Branch (LTSB)
Target Customers	Early adopters who want to evaluate new features	Use in production for enterprise/data center GPUs	Use in production for enterprise/data center GPUs and for customers looking for a longer cycle of support.
Major Release Cadence	At least once every 3 months	Twice a year[1]	At least once per hardware architecture[1]
Length of support	N/A	1 year	3 years
Minor release (bug updates and critical security updates)	N/A	Yes. Quarterly (or as-needed) bug and security releases for 1 year.	Yes. Quarterly (or as-needed) bug and security releases for 3 years.

[1] General guidance only. The actual security update and release cadence can change at NVIDIA's discretion.

Chapter 3. Supported Drivers and CUDA Toolkit Versions

NVIDIA releases CUDA Toolkit and GPU drivers at different cadences. The NVIDIA data center GPU driver software lifecycle and terminology are available in the lifecycle section of this documentation.

The release information can be scraped by automation tools (for example `jq`) by parsing the release information: releases.json.

The following table lists the current support matrix for CUDA Toolkit and NVIDIA data center drivers.

Table 2: CUDA and Drivers

	R580	**R595**	**R620**
Branch Designation	*Long Term Support Branch*	*Production Branch*	*Long Term Support Branch*
End of Life	June 2028	March 2027	September 2029
Maximum CUDA Major Version Supported Without Forward Compatibility Package[1]	CUDA 13	CUDA 13	CUDA 13

Only Long Term Support and Production branches are listed. New Feature Branches are short-lived and do not have an end-of-life date. For details, refer to *New Feature Branch*.

[1] See https://docs.nvidia.com/deploy/cuda-compatibility/forward-compatibility.html

Chapter 4. Software Deployment Workflow

The CUDA software environment consists of three parts:

- CUDA Toolkit (libraries, runtime and tools) - User-mode SDK used to build CUDA applications
- CUDA driver - User-mode driver component used to run CUDA applications (for example, `libcuda.so` on Linux systems)
- NVIDIA GPU device driver - Kernel-mode driver component for NVIDIA GPUs

On Linux systems, the CUDA driver and kernel mode components are delivered together in the NVIDIA display driver package. This is shown in the following figure.

The CUDA Toolkit is generally optional when GPU nodes are only used to run applications (as opposed to develop applications) as the CUDA application typically packages (by statically or dynamically linking against) the CUDA runtime and libraries needed.

4.1. Typical Workflow

A typical suggested workflow for bootstrapping a GPU node in a cluster:

1. *Install the NVIDIA drivers* (do not install CUDA Toolkit as this brings in additional dependencies that may not be necessary or desired)
2. Install the CUDA Toolkit using meta-packages. This provides additional control over what is installed on the system.
3. Install other components such as cuDNN or TensorRT as desired depending on the application requirements and dependencies.

4.2. Data Center Driver Installation

Note

The full content of this section is available at: https://docs.nvidia.com/datacenter/tesla/driver-installation-guide/index.html.

NVIDIA drivers are available in three formats for use with Linux distributions:

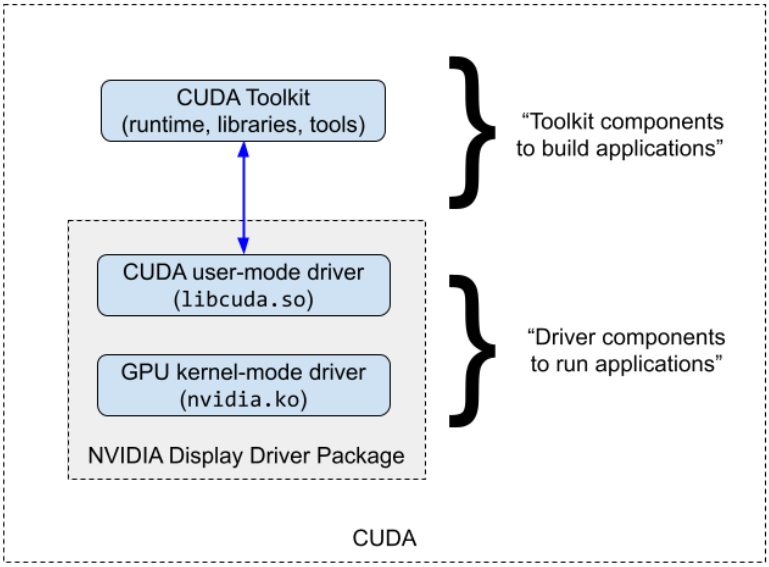


Figure 3: NVIDIA CUDA

- Runfile installers
- Package managers
- Containerized drivers

NVIDIA provides Linux distribution specific packages for drivers that can be used by customers to deploy drivers into a production environment. The links above provide detailed information and steps on how to install driver packages for supported Linux distributions, but a summary is provided below.

4.2.1. Installation Using Package Managers

Using package managers is the recommended method of installing drivers as this provides additional control over choice of driver branches, precompiled kernel modules, driver upgrades and additional dependencies such as Fabric Manager/NSCQ for NVSwitch systems.

On Ubuntu LTS

```
sudo apt-get -y install nvidia-open
```

To select a specific data center branch, install the pinning package first, then the driver:

```
sudo apt-get -y install nvidia-driver-pinning-<branch-number>
sudo apt-get -y install nvidia-open
```

Where the branch-number = the specific data center branch of interest (for example, 615).

Note

The `cuda-drivers-<branch-number>` packages stop at branch 580. NVIDIA does not publish them for branch 590 and later. On a current branch that command finds no installation candidate.

On RHEL 8

```
sudo dnf module install nvidia-driver:<stream>/<profile>
```

For example, nvidia-driver:latest-dkms/fm will install the latest drivers and also install the Fabric Manager dependencies to bootstrap an NVSwitch system such as HGX A100.

For more information on the supported streams/profiles, refer to this section in the documentation.

4.3. CUDA Toolkit Installation

The CUDA Toolkit packages are modular and offer the user control over what components of the CUDA Toolkit are installed on the system. CUDA supports a number of meta-packages that are described here.

Since the `cuda` or `cuda-<release>` packages also install the drivers, these packages may not be appropriate for data center deployments.

Instead, other packages such as `cuda-toolkit-<release>` should be used as this package has no dependency on the driver. The following example only installs the CUDA Toolkit 12.8 packages and does not install the driver.

```
sudo apt-get -y install cuda-toolkit-12-8
```

4.4. cuDNN Installation

NVIDIA cuDNN can also be installed from the CUDA network repository using Linux package managers by using the `libcudnn` and `libcudnn-dev` packages. An example is shown below:

Ubuntu LTS

```
CUDNN_VERSION=8.1.1.33 \
&& sudo apt-get -y install \
libcudnn8=$CUDNN_VERSION-1+cuda11.2 libcudnn8-dev=$CUDNN_VERSION-1+cuda11.2
```

Chapter 5. CUDA Toolkit, Driver, and Architecture Matrix

The CUDA driver provides an API that is backwards compatible. Thus, new NVIDIA drivers will always work with (applications compiled with) an older CUDA toolkit. This behavior of CUDA is documented here. Each CUDA Toolkit however, requires a minimum version of the NVIDIA driver. Corollarily, when using tools such as `nvidia-smi`, the NVIDIA driver reports a maximum version of CUDA supported and thus is able to run applications built with CUDA Toolkits up to that version.

CUDA Toolkit and drivers may also deprecate and drop support for GPU architectures over the product life cycle of the CUDA Toolkit. See the `-arch` and `-gencode` options in the CUDA compiler (nvcc) toolchain documentation.

Table 3: CUDA and Architecture Matrix

Architecture	CUDA Capability	First CUDA Toolkit Support	Last CUDA Toolkit Support	Last Driver Support
Blackwell	10.0 12.0	CUDA 12.8 CUDA 12.8	Ongoing Ongoing	Ongoing Ongoing
Hopper	9.0	CUDA 11.8 CUDA 12.0	Ongoing Ongoing	Ongoing Ongoing
Ada	8.9	CUDA 11.8	Ongoing	Ongoing
NVIDIA Ampere architecture	8.0 8.6	CUDA 11.0	Ongoing Ongoing	Ongoing Ongoing
Turing	7.5	CUDA 10.0	Ongoing	Ongoing
Volta	7.0	CUDA 9.0	CUDA 12.x	R580
Pascal	6.0 6.1	CUDA 8.0	CUDA 12.x CUDA 12.x	R580 R580
Maxwell	5.0 5.2 5.3	CUDA 6.5	CUDA 12.x CUDA 12.x CUDA 12.x	R580 R580 R580
Kepler	3.5 3.7	CUDA 6.0	CUDA 11.x CUDA 11.x	R470 R470
Kepler	3.0 3.2	CUDA 6.0	CUDA 10.2 CUDA 10.2	R470 R470
Fermi	2.0	CUDA 3.0	CUDA 8.0	R390

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