SUSE

Installing NVIDIA GPU Drivers on SUSE Linux Enterprise Server

WHAT?

NVIDIA GPU drivers use the full potential of the GPU unit.

WHY?

To learn how to install NVIDIA GPU drivers on SUSE Linux Enterprise Server to fully use the computing power of the GPU in higher-level applications, such as AI workloads.

EFFORT

Understanding the information in this article and installing NVIDIA GPU drivers on your SUSE Linux Enterprise Server host requires less than one hour of your time and basic Linux administration skills.

GOAL

You can install NVIDIA GPU drivers on a SUSE Linux Enterprise Server host with a supported GPU card attached.

Contents

1 Installing NVIDIA GPU drivers on SUSE Linux Enterprise Server

1.1 Introduction

This guide demonstrates how to implement host-level NVIDIA GPU support via the open-driver on SUSE Linux Enterprise Server 15 SP6. The open-driver is part of the core SUSE Linux Enterprise Server package repositories. Therefore, there is no need to compile it or download executable packages. This driver is built into the operating system rather than dynamically loaded by the NVIDIA GPU Operator. This configuration is desirable for customers that want to pre-build all artifacts required for deployment into the image, and where the dynamic selection of the driver version via Kubernetes is not a requirement.

1.2 Requirements

If you are following this guide, it assumes that you have the following already available:

- At least one host with SUSE Linux Enterprise Server 15 SP6 installed, physical or virtual.

- Your hosts are attached to a subscription as this is required for package access.

- A compatible NVIDIA GPU (https://github.com/NVIDIA/open-gpu-kernel-modules#compatible-gpus) ↗ installed or fully passed through to the virtual machine in which SUSE Linux Enterprise Server is running.

- Access to the `root` user—these instructions assume you are the `root` user, and not escalating your privileges via **sudo**.

1.3 Considerations before the installation

1.3.1 Select the driver generation

You must verify the driver generation for the NVIDIA GPU that your system has. For modern GPUs, the `G06` driver is the most common choice. Find more details in the support database (https://en.opensuse.org/SDB:NVIDIA_drivers#Install) ↗.

This section details the installation of the `G06` generation of the driver.

1.3.2   Additional NVIDIA components

Besides the NVIDIA open-driver provided by SUSE as part of SUSE Linux Enterprise Server, you might also need additional NVIDIA components. These could include OpenGL libraries, CUDA toolkits, command-line utilities such as `nvidia-smi`, and container-integration components such as nvidia-container-toolkit. Many of these components are not shipped by SUSE as they are proprietary NVIDIA software. This section describes how to configure additional repositories that give you access to these components and provides examples of using these tools to achieve a fully functional system.

1.4   The installation procedure

1. Add a package repository from NVIDIA. This allows pulling in additional utilities, for example, `nvidia-smi`.

```
# zypper ar \
  https://developer.download.nvidia.com/compute/cuda/repos/sles15/x86_64/ \
  cuda-sle15
# zypper --gpg-auto-import-keys refresh
```

2. Install the Open Kernel driver KMP and detect the driver version.

```
# zypper install -y --auto-agree-with-licenses \
  nv-prefer-signed-open-driver
# version=$(rpm -qa --queryformat '%{VERSION}\n' \
  nv-prefer-signed-open-driver | cut -d "_" -f1 | sort -u | tail -n 1)
```

3. You can then install the appropriate packages for additional utilities that are useful for testing purposes.

```
# zypper install -y --auto-agree-with-licenses \
nvidia-compute-utils-G06=${version}
```

4. Reboot the host to make the changes effective.

```
# reboot
```

5. Log back in and use the `nvidia-smi` tool to verify that the driver is loaded successfully and that it can both access and enumerate your GPUs.

```
# nvidia-smi
```

Installing NVIDIA GPU Drivers on SUSE Linux Enterprise Server

The output of this command should show you something similar to the following output. In the example below, the system has one GPU.

```
Fri Aug  1 15:32:10 2025
+-----------------------------------------------------------------------------------------+
| NVIDIA-SMI 575.57.08              Driver Version: 575.57.08      CUDA Version: 12.9     |
|-----------------------------------------+------------------------+----------------------+
| GPU  Name                 Persistence-M | Bus-Id          Disp.A | Volatile Uncorr. ECC |
| Fan  Temp   Perf          Pwr:Usage/Cap |           Memory-Usage | GPU-Util  Compute M. |
|                                         |                        |               MIG M. |
|=========================================+========================+======================|
|   0  Tesla T4                       On  |   00000000:00:1E.0 Off |                    0 |
| N/A   33C    P8              13W /   70W |      0MiB /  15360MiB |      0%      Default |
|                                         |                        |                  N/A |
+-----------------------------------------+------------------------+----------------------+


+-----------------------------------------------------------------------------------------+
| Processes:                                                                              |
|  GPU   GI   CI              PID   Type   Process name                          GPU Memory |
|        ID   ID                                                                  Usage      |
|=========================================================================================|
|  No running processes found                                                             |
+-----------------------------------------------------------------------------------------+
```

1.5 Validation of the driver installation

Running the **nvidia-smi** command has verified that, at the host level, the NVIDIA device can be accessed and that the drivers are loading successfully. To validate that it is functioning, you need to validate that the GPU can take instructions from a user-space application, ideally via a container and through the CUDA library, as that is typically what a real workload would use. For this, we can make a further modification to the host OS by installing `nvidia-container-toolkit`.

1. Install the `nvidia-container-toolkit` package from the NVIDIA Container Toolkit repository.

   ```
   # zypper ar \
   "https://nvidia.github.io/libnvidia-container/stable/rpm/"\
   nvidia-container-toolkit.repo
   # zypper --gpg-auto-import-keys install \
     -y nvidia-container-toolkit
   ```

   The `nvidia-container-toolkit.repo` file contains a stable repository `nvidia-container-toolkit` and an experimental repository `nvidia-container-toolkit-experimental`. Use the stable repository for production use. The experimental repository is disabled by default.

2. Verify that the system can successfully enumerate the devices using the NVIDIA Container Toolkit. The output should be verbose, with INFO and WARN messages, but no ERROR messages.

   ```
   # nvidia-ctk cdi generate --output=/etc/cdi/nvidia.yaml
   ```

   This ensures that any container started on the machine can employ discovered NVIDIA GPU devices.

3. You can then run a Podman-based container. Doing this via **podman** gives you a good way of validating access to the NVIDIA device from within a container, which should give confidence for doing the same with Kubernetes at a later stage.
   Give Podman access to the labeled NVIDIA devices that were taken care of by the previous command and simply run the **bash** command.

   ```
   # podman run --rm --device nvidia.com/gpu=all \
     --security-opt=label=disable \
     -it registry.suse.com/bci/bci-base:latest bash
   ```

You can now execute commands from within a temporary Podman container. It does not have access to your underlying system and is *ephemeral*—whatever you change in the container does not persist. Also, you cannot break anything on the underlying host.

4. Inside the container, install the required CUDA libraries. Identify their version from the output of the `nvidia-smi` command. From the above example, we are installing CUDA version 12.9 with many examples, demos and development kits to fully validate the GPU.

```
# zypper ar \
  http://developer.download.nvidia.com/compute/cuda/repos/sles15/x86_64/ \
  cuda-sle15-sp6
# zypper --gpg-auto-import-keys refresh

# zypper install -y cuda-libraries-12-9 cuda-demo-suite-12-9
```

5. Inside the container, run the `deviceQuery` CUDA example of the same version, which comprehensively validates GPU access via CUDA and from within the container itself.

```
# /usr/local/cuda-12.9/extras/demo_suite/deviceQuery Starting...

 CUDA Device Query (Runtime API)

Detected 1 CUDA Capable device(s)

Device 0: "Tesla T4"
  CUDA Driver Version / Runtime Version          12.9 / 12.9
  CUDA Capability Major/Minor version number:    7.5
  Total amount of global memory:                 14913 MBytes (15637086208 bytes)
  (40) Multiprocessors, ( 64) CUDA Cores/MP:     2560 CUDA Cores
  GPU Max Clock rate:                            1590 MHz (1.59 GHz)
  Memory Clock rate:                             5001 Mhz
  Memory Bus Width:                              256-bit
  L2 Cache Size:                                 4194304 bytes
  Maximum Texture Dimension Size (x,y,z)         1D=(131072), 2D=(131072, 65536),
 3D=(16384, 16384, 16384)
  Maximum Layered 1D Texture Size, (num) layers  1D=(32768), 2048 layers
  Maximum Layered 2D Texture Size, (num) layers  2D=(32768, 32768), 2048 layers
  Total amount of constant memory:               65536 bytes
  Total amount of shared memory per block:       49152 bytes
  Total number of registers available per block: 65536
  Warp size:                                     32
  Maximum number of threads per multiprocessor:  1024
  Maximum number of threads per block:           1024
  Max dimension size of a thread block (x,y,z): (1024, 1024, 64)
  Max dimension size of a grid size    (x,y,z): (2147483647, 65535, 65535)
```

```
    Maximum memory pitch:                          2147483647 bytes
    Texture alignment:                             512 bytes
    Concurrent copy and kernel execution:          Yes with 3 copy engine(s)
    Run time limit on kernels:                     No
    Integrated GPU sharing Host Memory:            No
    Support host page-locked memory mapping:       Yes
    Alignment requirement for Surfaces:            Yes
    Device has ECC support:                         Enabled
    Device supports Unified Addressing (UVA):      Yes
    Device supports Compute Preemption:            Yes
    Supports Cooperative Kernel Launch:            Yes
    Supports MultiDevice Co-op Kernel Launch:      Yes
    Device PCI Domain ID / Bus ID / location ID:   0 / 0 / 30
    Compute Mode:
       < Default (multiple host threads can use ::cudaSetDevice() with device
 simultaneously) >

deviceQuery, CUDA Driver = CUDART, CUDA Driver Version = 12.9, CUDA Runtime Version
 = 12.9, NumDevs = 1, Device0 = Tesla T4
Result = PASS
```

From inside the container, you can continue to run any other CUDA workload—such as compilers—to run further tests. When finished, you can exit the container.

```
# exit
```

> ❗ Important
>
> Changes you have made in the container and packages you have installed inside will be lost and will not impact the underlying operating system.

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