Machine Learning

# Using GPUs for Cloudera Machine Learning Projects

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# Contents

# Using GPUs for Cloudera Machine Learning projects

A GPU is a specialized processor that can be used to accelerate highly parallelized computationally-intensive workloads. Because of their computational power, GPUs have been found to be particularly well-suited to deep learning workloads. Ideally, CPUs and GPUs should be used in tandem for data engineering and data science workloads. A typical machine learning workflow involves data preparation, model training, model scoring, and model fitting. You can use existing general-purpose CPUs for each stage of the workflow, and optionally accelerate the math-intensive steps with the selective application of special-purpose GPUs. For example, GPUs allow you to accelerate model fitting using frameworks such as Tensorflow, PyTorch, and Keras.

**Important:** Starting with Cloudera Machine Learning (CML) 1.5.3, GPU nodes have been verified to be working on CentOS 7.9 and RHEL 8.8.

By enabling GPU support, data scientists can share GPU resources available on Cloudera Machine Learning workspaces. Users can request a specific number of GPU instances, up to the total number available, which are then allocated to the running session or job for the duration of the run.

For information on installing your GPUs, see *CDP Private Cloud Data Services Installation Software Requirements*, below.

### Related Information

CDP Private Cloud Experiences Installation Software Requirements
Provision an ML Workspace
Testing GPU Setup
GPU node setup

# Heterogeneous GPU clusters

When using heterogeneous GPU clusters to run sessions and jobs, the available GPU accelerator labels need to be selected during the creation of the workload.

### Selecting GPUs for a workload

The workload configuration displays a dropdown menu for the possible GPU accelerator labels, available on the Kubernetes cluster.

**Figure 1: Selecting GPUs for workload when starting a new session**

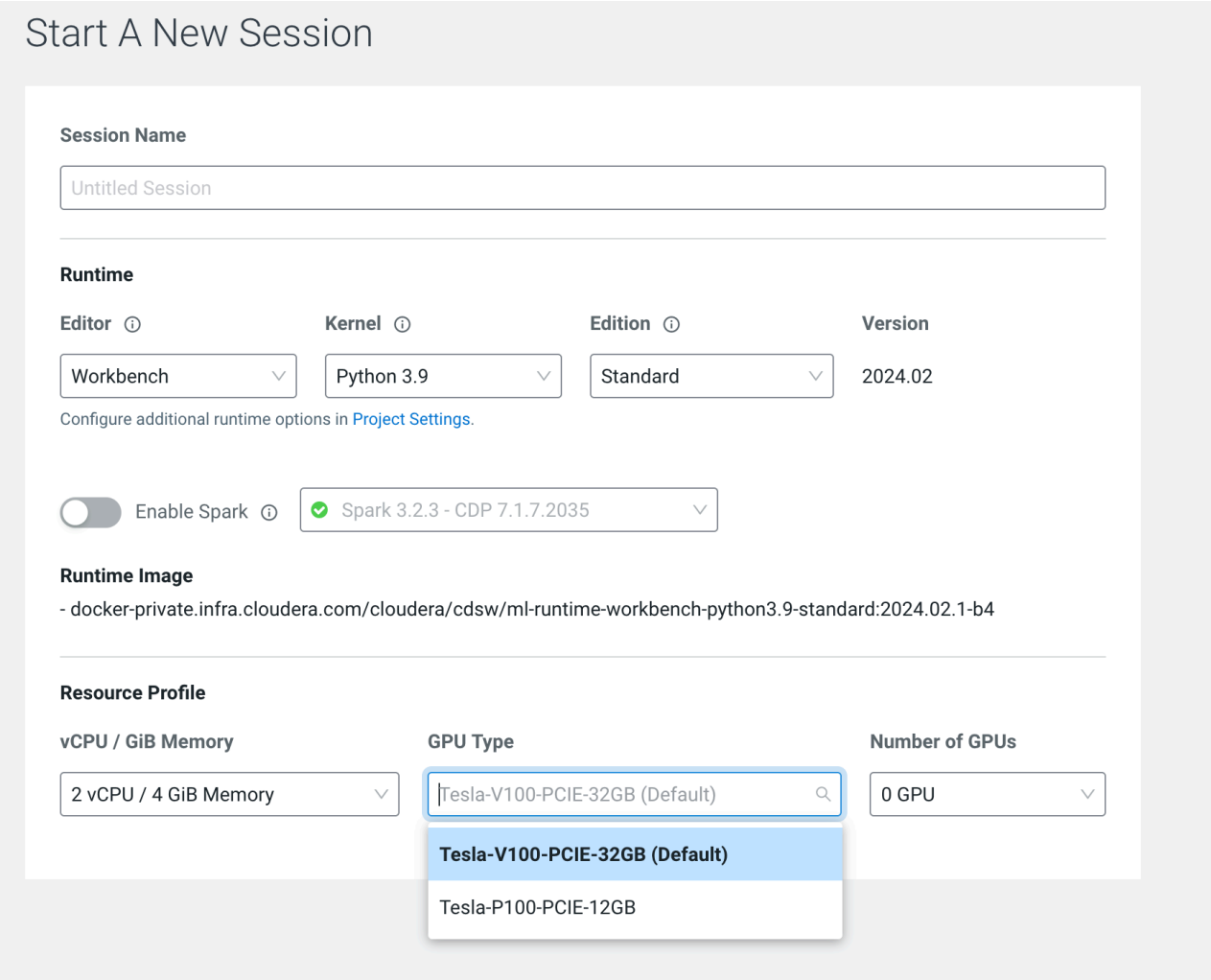
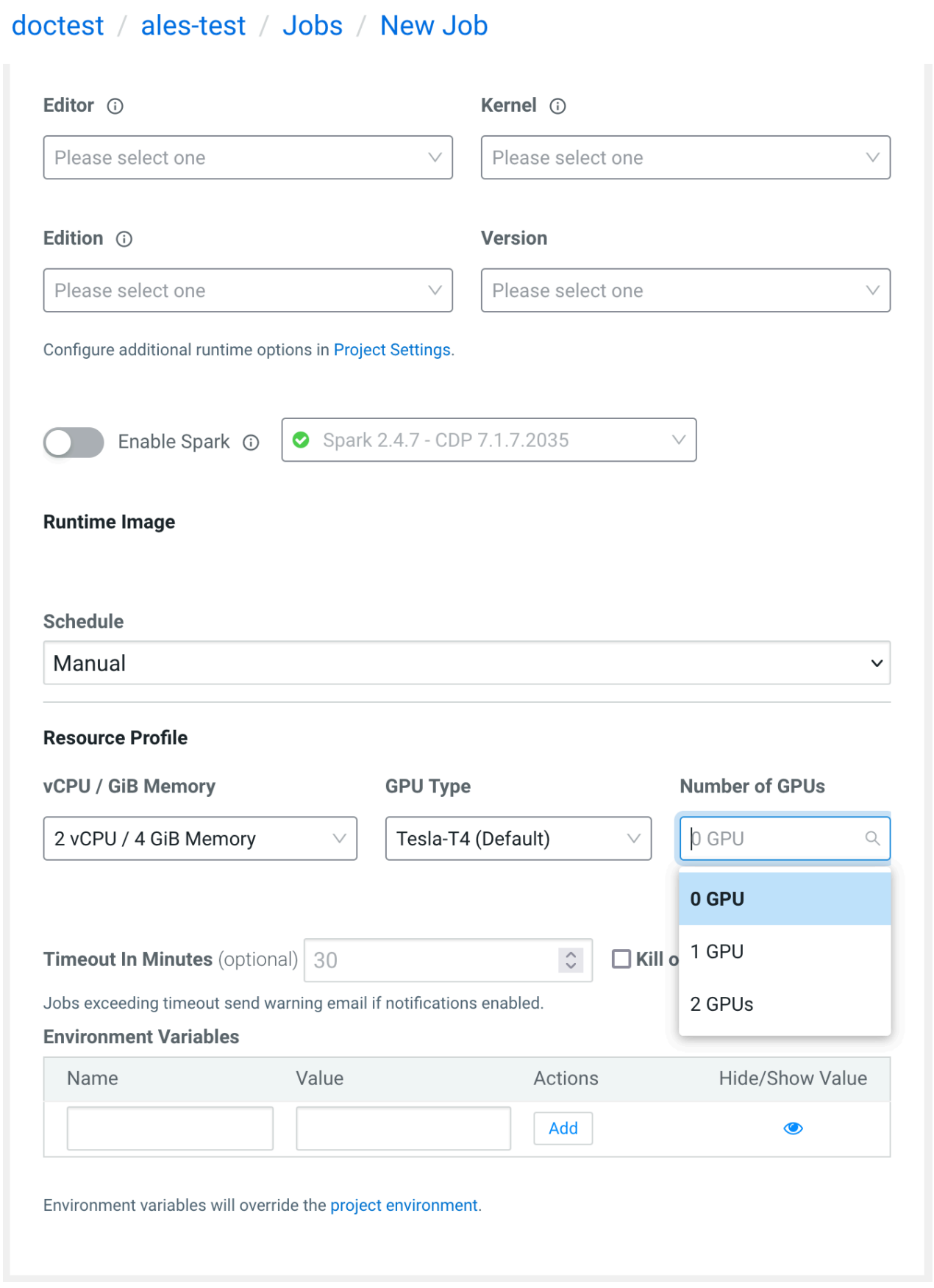



**Figure 2: Selecting GPUs for workload when starting a new job**


doctest / ales-test / Jobs / New Job
Editor
Please select one
Kernel
Please select one
Edition
Please select one
Version
Please select one
Configure additional runtime options in Project Settings.
Enable Spark
Spark 2.4.7 - CDP 7.1.7.2035
Runtime Image
Schedule
Manual
Resource Profile
vCPU / GiB Memory
2 vCPU / 4 GiB Memory
GPU Type
Tesla-T4 (Default)
Number of GPUs
0 GPU
0 GPU
1 GPU
2 GPUs
Timeout In Minutes (optional)
30
Kill o
Jobs exceeding timeout send warning email if notifications enabled.
Environment Variables
Name
Value
Actions
Hide/Show Value
Add
Environment variables will override the project environment.

If you are unsure about which GPU accelerator label to use, you can use the default value set by the Cloudera Machine Learning (CML) workspace administrator.

**Note:**

The number of GPUs you can provision for a single workload, is limited by what is available on a single node.

### APIv2 GPU workloads

APIv2 GPU workloads can also target a specific GPU.

The following code example presents details on identifying the GPU accelerator label:

```
# Instantiate the cml api client
import cmlapi
client = cmlapi.default_client()
# List the available gpu accelerator labels
client.list_all_accelerator_node_labels()

# Use the gpu accelerator label in the request body of the workload
job_body = cmlapi.CreateJobRequest(
    project_id="some_project_id",
    name="job_with_gpu_accelerator",
    script="some_job_script.py",
    kernel="some_runtime_kernel",
    runtime_identifier="some_runtime",
    nvidia_gpu = 1,
    accelerator_label_id = 2
)

apiv2client.create_job(
   project_id="some_project_id", body=job_body)
```

Existing APIv2 calls which do not specify a GPU accelerator ID can be launched using the default GPU accelerator, set by the CML Administrator.

A CML workload is backed by a Kubernetes Pod, which can only reserve as many resources as there are available on a single node.

### Related Information

CML API v2

# Testing GPU Setup

Use these code samples to test that your GPU setup works with several common deep learning libraries. The specific versions of libraries depend on the particular GPU used and the GPU driver version. You can use this testing for GPU setup using Legacy Engines.

1. Go to a project that is using the CUDA engine and click Open Workbench.
2. Launch a new session with GPUs.
3. Run the following command in the workbench command prompt to verify that the driver was installed correctly:

   ```
   ! /usr/bin/nvidia-smi
   ```

4. Use any of the following code samples to confirm that the new engine works with common deep learning libraries.

PyTorch

```
!pip3 install torch==1.4.0
from torch import cuda
assert cuda.is_available()
assert cuda.device_count() > 0
print(cuda.get_device_name(cuda.current_device()))
```

**Note:** The PyTorch installation requires at least 4 GB of memory.

Tensorflow

```
!pip3 install tensorflow-gpu==2.1.0
from tensorflow.python.client import device_lib
assert 'GPU' in str(device_lib.list_local_devices())
device_lib.list_local_devices()
```

Keras

```
!pip3 install keras
from keras import backend
assert len(backend.tensorflow_backend._get_available_gpus()) > 0
print(backend.tensorflow_backend._get_available_gpus())
```