



## **Utilize NVIDIA NGC Software**

### **NetApp Solutions**

NetApp  
August 13, 2023

This PDF was generated from [https://docs.netapp.com/us-en/netapp-solutions/ai/nvaie\\_ngc\\_setup.html](https://docs.netapp.com/us-en/netapp-solutions/ai/nvaie_ngc_setup.html) on August 13, 2023. Always check docs.netapp.com for the latest.

# Table of Contents

- Utilize NVIDIA NGC Software ..... 1
  - Setup ..... 1
  - Example Use Case - TensorFlow Training Job ..... 3

# Utilize NVIDIA NGC Software

[Previous: Initial Setup.](#)

This section describes the tasks that need to be performed in order to utilize NVIDIA NGC enterprise software within an NVIDIA AI Enterprise environment.

[Next: Setup.](#)

## Setup

[Previous: Utilize NVIDIA NGC Software.](#)

This section describes the initial setup tasks that need to be performed in order to utilize NVIDIA NGC enterprise software within an NVIDIA AI Enterprise environment.

### Prerequisites

Before you perform the steps that are outlined in this section, we assume that you have already deployed the NVIDIA AI Enterprise host software by following the instructions outlined on the [Initial Setup](#) page.

### Create an Ubuntu Guest VM with vGPU

First, you must create an Ubuntu 20.04 guest VM with vGPU. To create an Ubuntu 20.04 guest VM with vGPU, follow the instructions outline in the [NVIDIA AI Enterprise Deployment Guide](#).

### Download and Install NVIDIA Guest Software

Next, you must install the required NVIDIA guest software within the guest VM that you created in the previous step. To download and install the required NVIDIA guest software within the guest VM, follow the instructions outlined in sections 5.1-5.4 in the [NVIDIA AI Enterprise Quick Start Guide](#).



When performing the verification tasks outlined in section 5.4, you may need to use a different CUDA container image version tag as the CUDA container image has been updated since the writing of the guide. In our validation, we used 'nvidia/cuda:11.0.3-base-ubuntu20.04'.

### Download AI/Analytics Framework Container(s)

Next, you must download needed AI or analytics framework container images from NVIDIA NGC so that they will be available within your guest VM. To download framework containers within the guest VM, follow the instructions outlined in the [NVIDIA AI Enterprise Deployment Guide](#).

### Install and Configure the NetApp DataOps Toolkit

Next, you must install the NetApp DataOps Toolkit for Traditional Environments within the guest VM. The NetApp DataOps Toolkit can be used to manage scale-out data volumes on your ONTAP system directly from the terminal within the guest VM. To install the NetApp DataOps Toolkit within the guest VM, perform the following tasks.

1. Install pip.

```
$ sudo apt update
$ sudo apt install python3-pip
$ python3 -m pip install netapp-dataops-traditional
```

2. Log out of the guest VM terminal and then log back in.
3. Configure the NetApp DataOps Toolkit. In order to complete this step, you will need API access details for your ONTAP system. You may need to obtain these from your storage admin.

```
$ netapp_dataops_cli.py config
```

```
Enter ONTAP management LIF hostname or IP address (Recommendation: Use
SVM management interface): 172.22.10.10
Enter SVM (Storage VM) name: NVAIE-client
Enter SVM NFS data LIF hostname or IP address: 172.22.13.151
Enter default volume type to use when creating new volumes
(flexgroup/flexvol) [flexgroup]:
Enter export policy to use by default when creating new volumes
[default]:
Enter snapshot policy to use by default when creating new volumes
[none]:
Enter unix filesystem user id (uid) to apply by default when creating
new volumes (ex. '0' for root user) [0]:
Enter unix filesystem group id (gid) to apply by default when creating
new volumes (ex. '0' for root group) [0]:
Enter unix filesystem permissions to apply by default when creating new
volumes (ex. '0777' for full read/write permissions for all users and
groups) [0777]:
Enter aggregate to use by default when creating new FlexVol volumes:
aff_a400_01_NVME_SSD_1
Enter ONTAP API username (Recommendation: Use SVM account): admin
Enter ONTAP API password (Recommendation: Use SVM account):
Verify SSL certificate when calling ONTAP API (true/false): false
Do you intend to use this toolkit to trigger Cloud Sync operations?
(yes/no): no
Do you intend to use this toolkit to push/pull from S3? (yes/no): no
Created config file: '/home/user/.netapp_dataops/config.json'.
```

## Create a Guest VM template

Lastly, you must create a VM template based on your guest VM. You will be able to use this template to quickly create guest VMs for utilizing NVIDIA NGC software.

To create a VM template based on your guest VM, log into VMware vSphere, right-click on the guest VM name, choose 'Clone', choose 'Clone to Template...', and then follow the wizard.



[Next: Example Use Case - TensorFlow Training Job.](#)

## Example Use Case - TensorFlow Training Job

[Previous: Setup.](#)

This section describes the tasks that need to be performed in order to execute a TensorFlow training job within an NVIDIA AI Enterprise environment.

### Prerequisites

Before you perform the steps that are outlined in this section, we assume that you have already created a guest VM template by following the instructions outlined on the [Setup](#) page.

### Create Guest VM from Template

First, you must create a new guest VM from the template that you created in the previous section. To create a new guest VM from your template, log into VMware vSphere, right-click on the template name, choose 'New VM from This Template...', and then follow the wizard.

vSphere Client

<

vgpu-client-ubun

SummaryMonitorCo

172.22.10.100

NVAIE Datacenter

Discovered virtual machine

vCLS

nls-1.1.0-bios

spark01

spark02

spark03

SQL

SQL-Linux

ubuntu2004

vgpu-client-ubuntu2

Guest OS:

Compatibility

VMware Tool

Actions - vgpu-client-ubuntu2004

New VM from This Template...

Convert to Virtual Machine...

Clone to Template...

Clone to Library...

Move to folder...

Rename...

Edit Notes...

Tags & Custom Attributes

Add Permission...

Alarms

Remove from Inventory

Delete from Disk

vSAN

Recent TasksAlarms

Task Name	Target
Delete virtual machine	
Clone virtual machine	

AllMore Tasks

4

## Create and Mount Data Volume

Next, you must create a new data volume on which to store your training dataset. You can quickly create a new data volume using the NetApp DataOps Toolkit. The example command that follows shows the creation of a volume named 'imagenet' with a capacity of 2 TB.

```
$ netapp_dataops_cli.py create vol -n imagenet -s 2TB
```

Before you can populate your data volume with data, you must mount it within the guest VM. You can quickly mount a data volume using the NetApp DataOps Toolkit. The example command that follows shows the mounting of the volume that was created in the previous step.

```
$ sudo -E netapp_dataops_cli.py mount vol -n imagenet -m ~/imagenet
```

## Populate Data Volume

After the new volume has been provisioned and mounted, the training dataset can be retrieved from the source location and placed on the new volume. This typically will involve pulling the data from an S3 or Hadoop data lake and sometimes will involve help from a data engineer.

## Execute TensorFlow Training Job

Now, you are ready to execute your TensorFlow training job. To execute your TensorFlow training job, perform the following tasks.

1. Pull the NVIDIA NGC enterprise TensorFlow container image.

```
$ sudo docker pull nvcr.io/nvaie/tensorflow-2-1:22.05-tf1-nvaie-2.1-py3
```

2. Launch an instance of the NVIDIA NGC enterprise TensorFlow container. Use the '-v' option to attach your data volume to the container.

```
$ sudo docker run --gpus all -v ~/imagenet:/imagenet -it --rm  
nvcr.io/nvaie/tensorflow-2-1:22.05-tf1-nvaie-2.1-py3
```

3. Execute your TensorFlow training program within the container. The example command that follows shows the execution of an example ResNet-50 training program that is included in the container image.

```
$ python ./nvidia-examples/cnn/resnet.py --layers 50 -b 64 -i 200 -u  
batch --precision fp16 --data_dir /imagenet/data
```

[Next: Where to Find Additional Information.](#)

## Copyright information

Copyright © 2023 NetApp, Inc. All Rights Reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

LIMITED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (b)(3) of the Rights in Technical Data -Noncommercial Items at DFARS 252.227-7013 (FEB 2014) and FAR 52.227-19 (DEC 2007).

Data contained herein pertains to a commercial product and/or commercial service (as defined in FAR 2.101) and is proprietary to NetApp, Inc. All NetApp technical data and computer software provided under this Agreement is commercial in nature and developed solely at private expense. The U.S. Government has a non-exclusive, non-transferrable, nonsublicensable, worldwide, limited irrevocable license to use the Data only in connection with and in support of the U.S. Government contract under which the Data was delivered. Except as provided herein, the Data may not be used, disclosed, reproduced, modified, performed, or displayed without the prior written approval of NetApp, Inc. United States Government license rights for the Department of Defense are limited to those rights identified in DFARS clause 252.227-7015(b) (FEB 2014).

## Trademark information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.