



NVIDIA DGX OS SERVER VERSION 4.0.3

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Release Notes and Update Guide

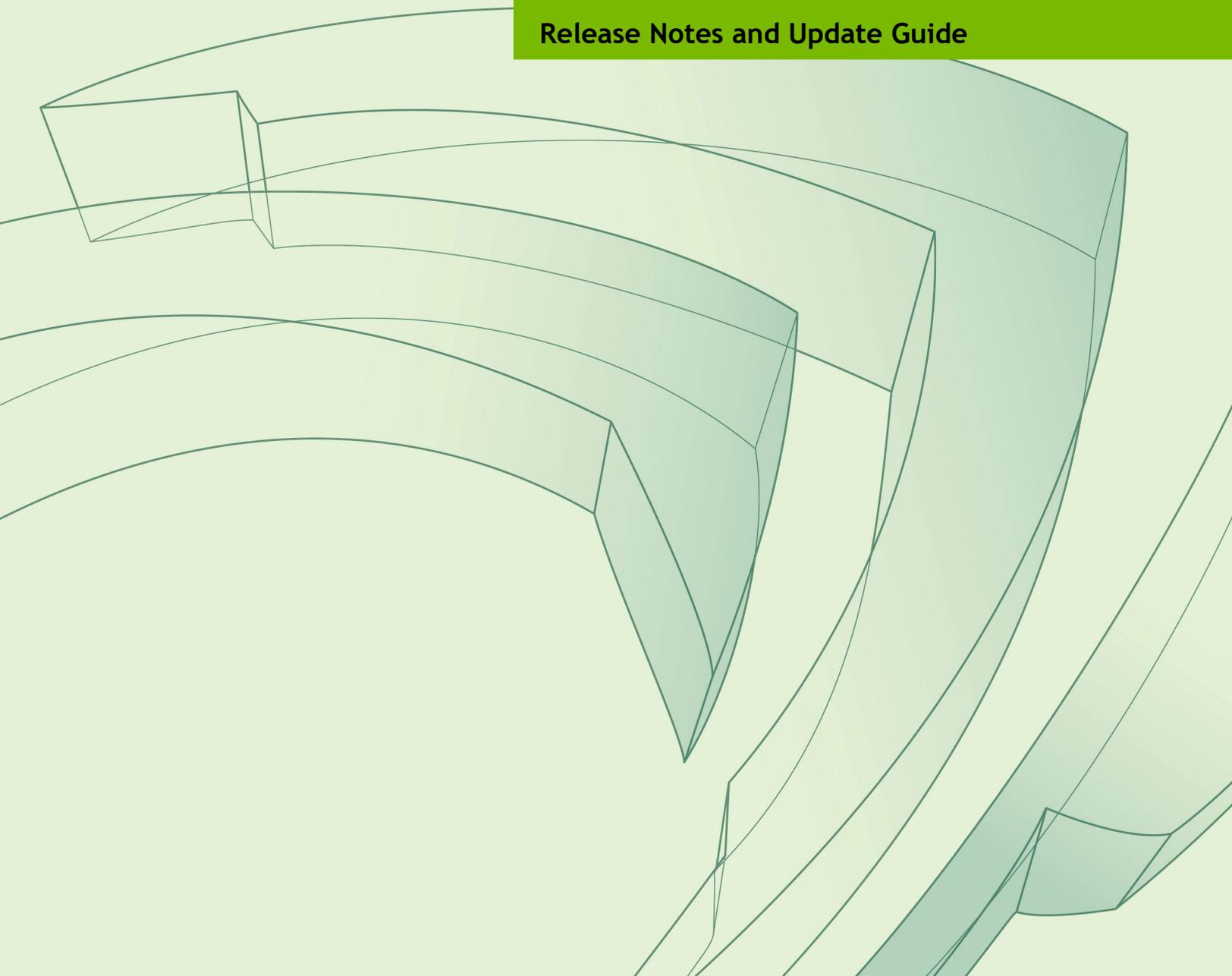


TABLE OF CONTENTS

NVIDIA DGX OS Server Release Notes for Version 4.0.3	3
Update Advisement.....	4
About Release 4.0	4
Version History	5
Version 4.0.3	5
Version 4.0.2	5
Version 4.0.1	5
Known Issues	6
Known Software Issues.....	6
Known DGX-2 System Issues	8
Known Issues Related to Ubuntu / Linux Kernel	12
DGX OS Server Software Content	15
DGX Server Firmware Version Reference	15
DGX-2 Firmware	15
Updating to Version 4.0.3	16
Connecting to the DGX server Console	16
Verifying the DGX Server Connection to the Repositories	17
Updating from 4.0.1+ to 4.0.3.....	18
Update Instructions	18
Recovering from an Interrupted or Failed Update	19
Appendix A. Third Party License Notice	20

NVIDIA DGX OS SERVER RELEASE NOTES FOR VERSION 4.0.3

This document describes version 4.0.3 of the NVIDIA® DGX™ OS Server Release 4.0 software and update package.

DGX OS Server 4.0.3 is provided as an ISO image which is available from NVIDIA Enterprise Support in the event the server needs to be re-imaged.

The software is also provided as an “over-the-network” update, which requires an internet connection and ability to access the NVIDIA public repository.

Refer to the *DGX-2 User Guide* (<https://docs.nvidia.com/dgx/dgx2-user-guide/index.html>) for the following instructions.

- ▶ How to re-image the system with the ISO image
- ▶ How to install the software on air-gapped systems

UPDATE ADVISEMENT

▶ NVIDIA GPU Cloud Containers

In conjunction with DGX OS Server 4.0.3, customers should update their NVIDIA GPU Cloud containers to the latest container release¹.

▶ Ubuntu Security Updates

Customers are responsible for keeping the DGX server up to date with the latest Ubuntu security updates using the 'apt full upgrade' procedure. See the [Ubuntu Wiki Upgrades](#) web page for more information. Also, the Ubuntu Security Notice site (<https://usn.ubuntu.com/>) lists known Common Vulnerabilities and Exposures (CVEs), including those that can be resolved by updating the DGX OS software.

ABOUT RELEASE 4.0

The following are the primary features of the DGX OS Server Release 4.0:

- ▶ First release to support the NVIDIA DGX-2 System
- ▶ Ubuntu 18.04 LTS
- ▶ NVIDIA GPU Driver Release 410
 - Supports CUDA 10.0
- ▶ Includes the NVIDIA Container Runtime for Docker (nvidia-docker2)

This release replaces the Docker Engine Utility for NVIDIA GPUs (nvidia-docker) with the NVIDIA Container Runtime for Docker (nvidia-docker2).
- ▶ New NVSM health monitoring software framework
Replaces `nvsysinfo` and `nvhealth`

¹ See the *NVIDIA Deep Learning Frameworks* documentation website (<http://docs.nvidia.com/deeplearning/dgx/index.htm>) for information on the latest container releases as well as <https://docs.nvidia.com/deeplearning/dgx/user-guide/index.html> for instructions on how to access them.

VERSION HISTORY

Version 4.0.3

- ▶ Updated NVIDIA GPU driver to version 410.72.
- ▶ Updated other software components.
 - DCGM updated to version 1.5.3
 - Docker updated to version 18.06.1-ce
 - NVSM components updated to version 18.10 (See [DGX OS Server Software Content](#) for details)
- ▶ Updated KVM² Software.
 - KVM software (dgx-kvm-sw) updated to version 18.10.2.
 - KVM image (dgx-kvm-image) updated to version 4-0-3.
 - Added FS-Cache support for guest VMs.
 - Added multi-queue support for logical drives.
 - Added multi-queue support for virtual networking.
 - Added NUMA tuning.
 - Added CPU tuning (emulator pin).

Version 4.0.2

- ▶ Updated NVIDIA GPU driver to version 410.48.

Version 4.0.1

- ▶ Initial release for the NVIDIA DGX-2 System
Does not support DGX-1 systems.
- ▶ NVIDIA GPU driver version 410.47
- ▶ See [About Release 4.0](#) for additional features list

² NVIDIA KVM is available only on DGX-2 systems. It is not available on DGX-1 systems.

KNOWN ISSUES

Known Software Issues

The following are known issues with the software.

- ▶ [Health Monitor Processes Listen on IPv4 and IPv6 Interfaces](#)
- ▶ [Apparmor Profile May not Work with Some Containers](#)
- ▶ [NVSM Labels 100G Ethernet Incorrectly](#)
- ▶ [InfiniBand Bandwidth Drops for KVM Guest VMs](#)

Health Monitor Processes Listen on IPv4 and IPv6 Interfaces

Issue

Two processes within the NVIDIA Health Monitor (NVSM) framework - "mosquitto" and "nvsm_apis" - listen on all IPv4 and IPv6 interfaces, on ports 273 (nvsm_apis) and 1883 (mosquitto).

Workaround

If this violates your organization's security policies, you can disable the associated services.



NOTE: This disables all NVSM health monitoring functionality.

List of services:

- mosquitto
- nvsm-apis
- nvsm-apis-plugin-environment
- nvsm-apis-mqtt
- nvsm-apis-plugin-memory
- nvsm-apis-mongodb
- nvsm-apis
- nvsm-apis-selwatcher
- nvsm-storage-dshm
- nvsm-env-dshm
- nvsm-sys-dshm

Instructions for removing

Perform the following for each service

```
sudo systemctl stop <service>  
sudo systemctl disable <service>
```

Apparmor Profile May not Work with Some Containers

Issue

Apparmor is enabled in this version of the DGX OS Server, with Docker generating a default profile. The default profile may or may not work with your containers.

Workaround

If there is a conflict with your containers, then either

- ▶ Disable Apparmor, or
- ▶ Provide a custom Apparmor profile and include it in the docker run command.

NVSM Labels 100G Ethernet Incorrectly

Issue

NVSM CLI, such as the `nvsm show health` command, incorrectly labels Ethernet tests for 100G Ethernet controllers as 10G Ethernet.

Resolution

This will be fixed in a future update to the DGX OS Server software and NVSM.

InfiniBand Bandwidth Drops for KVM Guest VMs

Issue

The InfiniBand bandwidth when running on multi-GPU guest VMs is lower than when running on bare metal.

Explanation

Currently, performance when using GPUDirect within a guest VM will be lower than when used on a bare-metal system.

Known DGX-2 System Issues

The following are known issues specific to the DGX-2 server.

- ▶ [Hot-plugging of Storage NVMe Drives is not Supported](#)
- ▶ [Storage NVMe Removal May Result in Removal of Different NVMe Drive](#)
- ▶ [System BIOS Password Feature is Ineffective](#)
- ▶ [Micron Storage NVMe Temperature Monitoring Does Not Work](#)
- ▶ [BMC SNMP Community String Limitations](#)
- ▶ [Some BMC Dashboard Quick Links Appear Erroneously](#)
- ▶ [Long Boot Time](#)

Hot-plugging of Storage NVMe Drives is not Supported

Issue

Hot-plugging or hot-swapping one of the storage non-volatile memory express (NVMe) drive might result in system instability.

Resolution

Turn off the system before removing and replacing any of the storage NVMe drives. This will be resolved in a future software update.

Storage NVMe Removal May Result in Removal of Different NVMe Drive

Issue

When attempting to remove access to an NVMe drive using the following command,

```
echo 1 > /sys/class/nvme/nvmex/device/remove
```

where *X* specifies which NVMe drive to remove, other NVMe drives may get removed.

Resolution

This is the result of an issue in the NVMe driver, and will be resolved in a future software update. To work around, shut down the system before removing the NVMe drive.

System BIOS Password Feature is Ineffective

Issue

After setting a password for accessing the system BIOS settings, a user can access the settings by pressing return when prompted to enter a password.

Resolution

This issue will be resolved in a future software update.

Micron Storage NVMe Temperature Monitoring Does Not Work

Issue

Some Micron storage NVMe drives shipped with the server do not have temperature monitoring enabled.

Workaround

Enable temperature monitoring as follows:

1. From the command line, check which NVMe drives need to have temperature monitoring enabled.

```
sudo /opt/MicronTechnology/MicronMSECLI/msecli -L
```

2. Note the Device Name that does not show a temperature reading, then enter the following for each affected NVMe drive.

```
sudo /opt/MicronTechnology/MicronMSECLI/msecli -M -k 1 -n <Device Name>
```

BMC SNMP Community String Limitations

Issue

The DGX-2 BMC has the following SNMP Community String limitations:

- No support for SNMPv3
- No SNMP configuration controls in the BMC dashboard
- No support for setting RO and RW permissions from the command line ipmitool.

Resolution

This will be resolved in a future BMC firmware release.

Some BMC Dashboard Quick Links Appear Erroneously

Issue

On the BMC dashboard, the following Quick Links appear by mistake and should not be used.

- Maintenance->Firmware Update
- Settings->NvMeManagement->NvMe P3700Vpd Info

Resolution

These quick links will be removed from the menu in a future BMC firmware release.

Long Boot Time

Issue

The DGX-2 System boot process can take over five minutes from the start of the system boot until the login prompt.

Workaround

Part of the boot process involves setting up of the PXE boot feature. If you do not need PXE boot functionality, you can shorten the boot time by disabling PXE boot for all installed Mellanox cards as follows.

 **NOTE: This disables the ability to perform PXE boot from the ConnectX 5 network adapters.**

1. Start the Mellanox Software Tools driver.

```
$ sudo mst start
```

2. Determine the Mellanox cards that have PXE boot enabled.

```
$ sudo mlxconfig query|grep -i -e "device\|EXP_ROM_UEFI_x86_ENABLE"
```

Look for any Mellanox devices that show EXP_ROM_UEFI_x86_ENABLE as True as highlighted in the following example.

```
Device #5:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf4
```

EXP_ROM_UEFI_x86_ENABLE	True (1)
-------------------------	----------

In this example, PXE boot needs to be disabled for /dev/mst/mt4119_pciconf4.

3. Disable PXE boot for each required card.

Example:

```
$ sudo mlxconfig -d /dev/mst/mt4119_pciconf4 set
EXP_ROM_UEFI_x86_ENABLE=0
```

4. Verify that all ports show EXP_ROM_UEFI_x86_ENABLE as False (0).

```
~$ sudo mlxconfig query|grep -i -e "device\|EXP_ROM_UEFI_x86_ENABLE"
Device #1:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf8
                EXP_ROM_UEFI_x86_ENABLE                False(0)
Device #2:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf7
                EXP_ROM_UEFI_x86_ENABLE                False(0)
Device #3:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf6
                EXP_ROM_UEFI_x86_ENABLE                False(0)
Device #4:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf5
                EXP_ROM_UEFI_x86_ENABLE                False(0)
Device #5:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf4
                EXP_ROM_UEFI_x86_ENABLE                False(0)
Device #6:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf3
                EXP_ROM_UEFI_x86_ENABLE                False(0)
Device #7:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf2
                EXP_ROM_UEFI_x86_ENABLE                False(0)
Device #8:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf1
                EXP_ROM_UEFI_x86_ENABLE                False(0)
Device #9:
Device type:    ConnectX5
Device:        /dev/mst/mt4119_pciconf0
                EXP_ROM_UEFI_x86_ENABLE                False(0)
```

Known Issues Related to Ubuntu / Linux Kernel

The following are known issues related to the Ubuntu OS or the Linux kernel that affect the DGX server.

- ▶ [System May Slow Down When Using mpirun](#)
- ▶ [FS-Cache Assertion Error Leading to System Panic May Occur](#)
- ▶ [Network Performance Drop](#)
- ▶ [PKCS Errors Appear When the System Boots](#)

System May Slow Down When Using `mpirun`

Issue

Customers running Message Passing Interface (MPI) workloads may experience the OS becoming very slow to respond. When this occurs, a log message similar to the following would appear in the kernel log:

```
kernel BUG at /build/linux-fQ94TU/linux-4.4.0/fs/ext4/inode.c:1899!
```

Explanation

Due to the current design of the Linux kernel, the condition may be triggered when `get_user_pages` is used on a file that is on persistent storage. For example, this can happen when `cudaHostRegister` is used on a file path that is stored in an ext4 filesystem. DGX systems implement `/tmp` on a persistent ext4 filesystem.

Workaround



NOTE: If you performed this workaround on a previous DGX OS software version, you do not need to do it again after updating to the latest DGX OS version.

In order to avoid using persistent storage, MPI can be configured to use shared memory at `/dev/shm` (this is a temporary filesystem).

If you are using Open MPI, then you can solve the issue by configuring the Modular Component Architecture (MCA) parameters so that `mpirun` uses the temporary file system in memory.

For details on how to accomplish this, see the Knowledge Base Article [DGX System Slows Down When Using mpirun](#) (requires login to the [NVIDIA Enterprise Support portal](#)).

FS-Cache Assertion Error Leading to System Panic May Occur

Issue

An issue in the Linux kernel can, under some workloads, cause a kernel thread to crash due to an FS-Cache service assertion failure.

This can be confirmed by examining the kernel logs (`/var/log/kern.log*`).

Example:

```
Mar 27 11:19:42 dev-dgx01 kernel: [514599.193456] FS-Cache:
Mar 27 11:19:42 dev-dgx01 kernel: [514599.193536] FS-Cache: Assertion
failed
Mar 27 11:19:42 dev-dgx01 kernel: [514599.193605] FS-Cache: 6 == 5 is
false
Mar 27 11:19:42 dev-dgx01 kernel: [514599.193767] -----[ cut
here ]-----
Mar 27 11:19:42 dev-dgx01 kernel: [514599.193843] kernel BUG at
/build/linux-3phnTq/linux-4.4.0/fs/fscache/operation.c:494!
```

Workaround



NOTE: If you performed this workaround on a previous DGX OS software version, you do not need to do it again after updating to the latest DGX OS version.

The FS-Cache service can be disabled to prevent system panics as follows.

1. Remove FS-Cache options from NFS or CIFS volumes.

Edit the `/etc/fstab` file to ensure that when mounting an NFS or CIFS volume, the "fsc" option is not used.

For example, remove the highlighted portion:

```
nfs-server.domain:/volume /mnt nfs
ro,noatime,rsize=32768,wsizer=32768,nolock,tcp,intr,fsc,nofail,nfsver
s=3 0 0
```

2. Remount the NFS volume without FS-Cache.

```
$ sudo umount /mnt
$ sudo mount /mnt
```

3. Disable the FS-Cache service.
 - a) Stop the FS-cache service.

```
$ sudo service cachefilesd stop
```

b) Edit `/etc/default/cachefilesd` and set "RUN=no".

For more background information, see the Knowledge Base Article [DGX-1 System Panic Due to FS-Cache Assertion Failure](#) (requires login to [NVIDIA Enterprise Support](#)).

Network Performance Drop

Issue

An issue with the Ubuntu kernel since 4.4.0-116 results in slower network performance when running server-side UDP workloads.

Details

As of the DGX OS Server 4.0.3 release, the Ubuntu kernel (4.15.0-29) is still subject to this issue. A later kernel version may resolve the issue, at which point an over-the-network update of the DGX OS software will incorporate the fix.

PKCS Errors Appear When the System Boots

Issue

When the DGX system boots, "PKCS#7 signature not signed with a trusts key" messages appear on the console and system logs.

Explanation

DGX OS Server installs Ubuntu 18.04, which checks all kernel modules for signatures even though Secure Boot is not enabled. Since the NVIDIA drivers are not part of the Ubuntu kernel, the drivers will be flagged with the message when the system boots.

This does not affect the system nor indicate a problem with system software.

DGX OS SERVER SOFTWARE CONTENT

The following table provides version information for software included in the DGX OS Server ISO image.

Component	Version
DGX OS Server	4.0.3
GPU Driver	410.72
NVIDIA Container Runtime for Docker	2.0.3
Ubuntu	18.04 LTS
Ubuntu kernel	4.15.0-29 or later
Docker CE	18.06.1-ce
NVIDIA System Health Monitor (NVSM)	nvsm-cli 18.10.3 nvsm-dshm 18.10.12-1 nvsm-apis 18.10.3
Data Center GPU Management (DCGM)	1.5.3
Mellanox OFED	MLNX 4.4-2.0.7.0

DGX SERVER FIRMWARE VERSION REFERENCE

The following table shows the firmware and BIOS versions for the DGX hardware at the time of this release. Information provided for reference purposes.

DGX-2 Firmware

Component	Version	Notes
BMC	V01.00.01	Released versions for DGX-2 at the time of this software release. Information provided for reference purposes.
SBIOS	V0.17	
VBIOS	88.00.6B.00.01	
InfiniBand FW	16.23.1020	
PSU FW	2.5	
SSD (Samsung OS drive)	CXV8601Q	
SSD (Micron storage drive)	101008R0	

UPDATING TO VERSION 4.0.3

These instructions explain how to update the DGX OS server software through an internet connection to the NVIDIA public repository. The process updates a DGX system image to the latest QA'd versions of the entire DGX software stack, including the drivers.

Perform the updates using commands on the DGX server console.

CONNECTING TO THE DGX SERVER CONSOLE

Connect to the DGX server console using either a direct connection or a remote connection through the BMC.

 **NOTE:** SSH can be used to perform the update. However, if the Ethernet port is configured for DHCP, there is the potential that the IP address can change after the DGX system is rebooted during the update, resulting in loss of connection. If this happens, connect using either a direct connection or through the BMC to continue the update process.

 **WARNING:** Connect directly to the DGX server console if the DGX is connected to a 172.17.xx.xx subnet.

DGX OS Server software version 4.0.3 installs Docker CE which uses the 172.17.xx.xx subnet by default for Docker containers. If the DGX server is on the same subnet, you will not be able to establish a network connection to the DGX server.

Refer to the DGX-2 User Guide for instructions on how to change the default Docker network settings after performing the update.

Direct Connection

1. Connect a display to the VGA connector and a keyboard to any one of the USB ports.
2. Power on the DGX server.

Remote Connection through the BMC

Refer to the DGX-2 user guide for instructions on establishing a remote connection to the BMC.

VERIFYING THE DGX SERVER CONNECTION TO THE REPOSITORIES

Before attempting to perform the update, verify that the DGX server network connection can access the public repositories and that the connection is not blocked by a firewall or proxy.

Enter the following on the DGX-2 system.

```
$ wget -O f1-changelogs http://changelogs.ubuntu.com/meta-release-lts
$ wget -O f2-archive
http://archive.ubuntu.com/ubuntu/dists/bionic/Release
$ wget -O f3-usarchive
http://us.archive.ubuntu.com/ubuntu/dists/bionic/Release
$ wget -O f4-security
http://security.ubuntu.com/ubuntu/dists/bionic/Release
$ wget -O f5-download
http://download.docker.com/linux/ubuntu/dists/bionic/Release
$ wget -O f6-international
http://international.download.nvidia.com/dgx/repos/dists/bionic/Release
```

All the **wget** commands should be successful and there should be six files in the directory with non-zero content.

UPDATING FROM 4.0.1+ TO 4.0.3

For Release 4.0, only updates from versions 4.0.1 and later are supported with these instructions. To update from version 4.0.0, you must re-image the system.

See the section [Connecting to the DGX Console](#) for guidance on connecting to the console to perform the update.



CAUTION: These instructions update all software for which updates are available from your configured software sources, including applications that you installed yourself. If you want to prevent an application from being updated, you can instruct the Ubuntu package manager to keep the current version. For more information, see [Introduction to Holding Packages](#) on the Ubuntu Community Help Wiki.

Update Instructions

1. If you have not already done so, verify that your DGX-2 system can access the public repositories as explained in [Verifying the DGX Server Connection to the Repositories](#).

1. Update the list of available packages and their versions.

```
$ sudo apt update
```

2. Review the packages that will be updated.

```
$ sudo apt full-upgrade -s
```

To prevent an application from being updated, instruct the Ubuntu package manager to keep the current version. See [Introduction to Holding Packages](#).

3. Upgrade to version 4.0.3.

```
$ sudo apt full-upgrade
```

- Answer any questions that appear.
 - Most questions require a Yes or No response. When asked to select the grub configuration to use, select the current one on the system.
 - Other questions will depend on what other packages were installed before the update and how those packages interact with the update.
 - If a message appears indicating that `nvidia-docker.service` failed to start, you can disregard it and continue with the next step. The service will start normally at that time.
4. Reboot the system.

Recovering from an Interrupted or Failed Update

If the script is interrupted during the update, such as from a loss of power or loss of network connection, then restore power or restore the network connection, whichever caused the interruption.

- ▶ If the system encounters a kernel panic after you restore power and reboot the DGX-2, you will not be able to perform the over-the-network update. You will need to re-image the DGX-2 with the latest image (see the [DGX-2 User Guide](#) for instructions) and then perform the network update.

If you are successfully returned to the Linux command line, continue following the instructions from step 2 in the [Updating from Version 4.0.x to 4.0.3](#) update instructions

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