NVIDIA System Management User Guide

Release 20.09

NVIDIA

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Contents

Chapter 1. Introduction

NVIDIA® System Management (NVSM) is a software framework for monitoring NVIDIA DGX™ nodes in a data center.

► For DGX Servers, it includes active health monitoring, system alerts, and log generation.

► For DGX Station, is it limited to using the CLI to check the health of the system and obtain diagnostic information.

NVSM can be used as a standalone utility from the command line by system administrators.

The following is a high level diagram of the NVSM framework, showing the NVSM API services at the heart of the framework, the DGX System Health Monitors (DSHM) responsible for monitoring the health of key system components, and the NVSM CLI for user control.
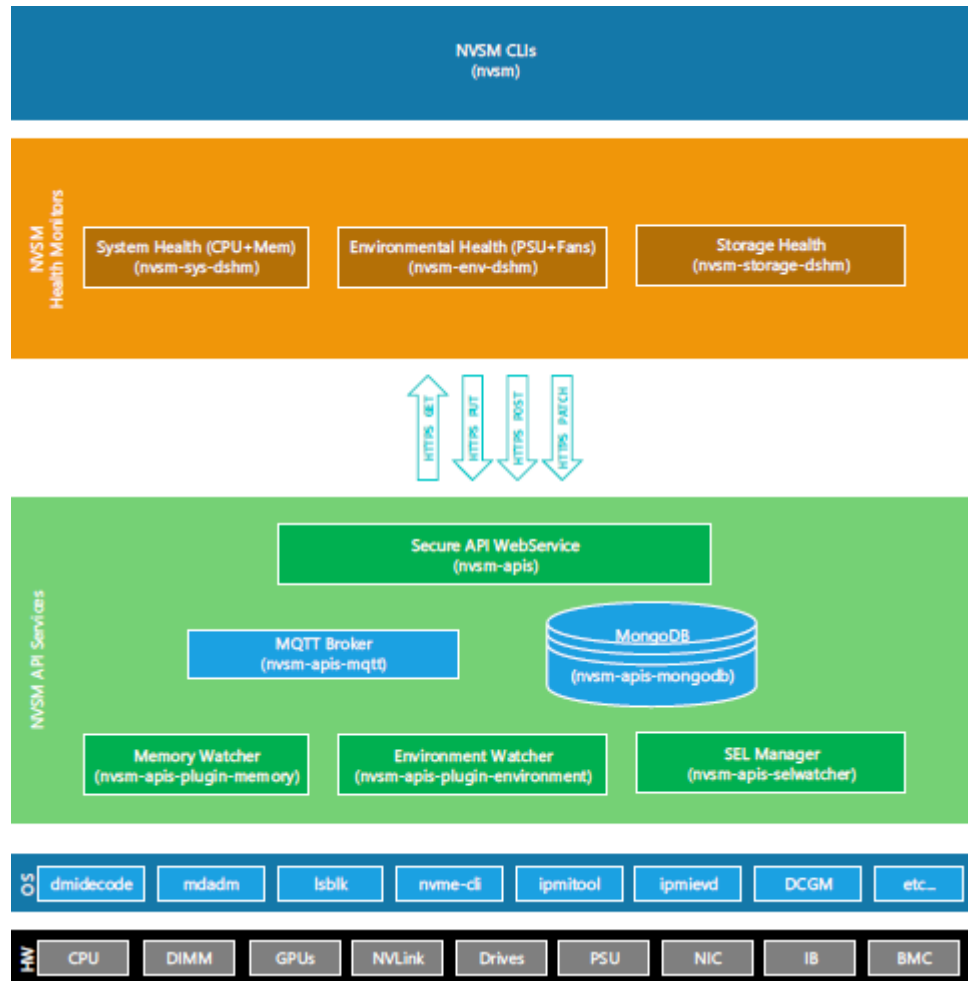
Note: DSHM functionality is not supported on DGX Station.

1.1. Verifying NVSM API Services

`nvsm_api_gateway` is part of the DGX OS image and is launched by systemd when DGX boots. The following are the services running under NVSM-APIS.

`nvsm_api_gateway-plugin-environment`

`nvsm_api_gateway-mqtt`

`nvsm_api_gateway-plugin-memory`

`nvsm_api_gateway`

`nvsm_api_gateway-selwatcher`

You can verify if each NVSM-APIS service is up and running using the 'systemctl' command. For example, the following command verifies the memory service.

```
$ sudo systemctl status nvsm_api_gateway-plugin-memory
```

You can also view all the NVSM-APIS services and their status with the following command.

```
$ sudo systemctl status -all nvsm_api_gateway*
```

1.2. Configurable DSHM Features

DSHM contains the following features that you can configure using the NVSM CLI:

- ► Health Monitor Alerts
- ► Health Monitor Policies

1.2.1. Health Monitor Alerts

Alerts are events of significance that require attention. When a health monitor detects such an event in the subsystem that it monitors, it generates an alert to inform the user. The default behavior is to log the alerts in persistent storage as well as to send an E-mail notification to registered users. Refer to the section *Using the NVSM CLI* for details about configuring users for receiving alert E-mail notifications.

Each alert has a 'state'. An active alert can be in a 'critical' or 'warning' state. Here, 'critical' implies an event that needs immediate action, and 'warning' implies an event that needs user attention. When the alerting condition is removed, the alert state changes to 'cleared'. Details of how to view the generated alerts recorded in the database are available in the section *Using the NVSM CLI*.

1.2.2. DSHM Alert List

The following table describes each DSHM alert ID.

Message and details	Alert ID	Component ID	Severity	Recommended Action
Unsupported drive configuration in {} (Drive(s) missing or Drive placement not in recommended slots. Drives found at these slots: {}. Supported Configurations are: {})	NV-DRIVE-01	<drive slot>	Critical	See Recommended Action A below.
System entered degraded mode, drive in {} is reporting an error. (Media errors detected in drive.)	NV-DRIVE-02	<drive slot>	Warning	See Recommended Action A below.

Table 1 – continued from previous page

Message and details	Alert ID	Component ID	Severity	Recommended Action
System entered degraded mode, drive in {} is reporting an error. (IO errors detected in drive.)	NV-DRIVE-03	\<drive slot\>	Warning	See Recommended Action A below.
System entered degraded mode, drive in {} is reporting an error. (NVMe controller failure detected in drive.)	NV-DRIVE-04	\<drive slot\>	Critical	See Recommended Action A below.
System entered degraded mode, drive in {} is reporting an error. (Available capacity percentage below critical threshold for drive.)	NV-DRIVE-05	\<drive slot\>	Critical	See Recommended Action A below.
System entered degraded mode, drive in {} is reporting an error.	NV-DRIVE-06	\<drive slot\>	Critical	See Recommended Action A below.
System entered degraded mode, drive in {} is reporting an error. (Drive used percentage above critical threshold for drive.)	NV-DRIVE-07	\<drive slot\>	Warning	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. ({RAID-0/RAID-1/Partition} is corrupted.)	NV-VOL-01	NA	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Power supply module has failed.)	NV-PSU-01	\<PSU#\> where # is the PSU number.	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (operating temperature exceeds the thermal specifications of the component.)	NV-PSU-02	\<PSU#\> where # is the PSU number.	Warning	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Input to the PSU is missing)	NV-PSU-03	\<PSU#\> where # is the PSU number.	Critical	See Recommended Action A below.

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Table 1 – continued from previous page

Message and details	Alert ID	Component ID	Severity	Recommended Action
System entered degraded mode, {} is reporting an error. (Input voltage is out of range for the Power Supply Module) (Input voltage is out of range for the Power Supply Module)	NV-PSU-04	<PSU#> where # is the PSU number.	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (PSU is missing)	NV-PSU-05	<PSU#> where # is the PSU number.	Warning	See Recommended Action A below.
Failures in Power supply modules have been detected. (System is operating in degraded performance mode.)	NV-PSU-06		Warning	Rectify the issues observed on the PSUs. Then see Recommended Action A below.
Failures in Power supply modules have been detected. (System is in power failed state)	NV-PSU-07		Critical	Rectify the issues observed on the PSUs. Then see Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Operating temperature exceeds the thermal specifications of the component.)	NV-PDB-01	<PDB#> where # is the PDB number	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Fan speed reading has fallen below the expected speed setting.)	NV-FAN-01	<FAN#_F> or <FAN#_R> where # is the fan module number. F is for front fan. R is for rear fan.	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Fan readings are inaccessible.)	NV-FAN-02	<FAN#_F> or <FAN#_R> where # is the fan module number. F is for front fan. R is for rear fan.	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (An unrecoverable CPU Internal error has occurred.)	NV-CPU-01	<CPU#> where # is the CPU socket number (CPU0 or CPU1)	Critical	See Recommended Action A below.

Table 1 – continued from previous page

Message and details	Alert ID	Component ID	Severity	Recommended Action
System entered degraded mode, {} is reporting an error. (CPU Thermtrip has occurred, processor socket temperature exceeded the thermal specifications of the component.)	NV-CPU-02	<CPU#> where # is the CPU socket number (CPU0 or CPU1)	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Processor socket temperature exceeded the thermal specifications of the component.)	NV-CPU-03		Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Processor socket temperature exceeded the thermal specifications of the component.)	NV-CPU-04		Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Uncorrectable error is reported).	NV-DIMM-01	<CPU#_DIMM_@$> where # = (1, 2) @ = (A, B, C, D, E, F) $ = (1, 2)	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Correctable errors reported exceeds the configured threshold.)	NV-DIMM-02	<CPU#_DIMM_@$> where # = (1, 2) @ = (A, B, C, D, E, F) $ = (1, 2)	Warning	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (Unrecoverable error is observed on the DIMM, specific details of the error are unavailable.)	NV-DIMM-03	<CPU#_DIMM_@$> where # = (1, 2) @ = (A, B, C, D, E, F) $ = (1, 2)	Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting an error. (DIMM presence is not expected in this slot, please verify the DIMM details.)	NV-DIMM-04			See Recommended Action A below.
System entered degraded mode, GPU is reporting an error (Critical error has been reported by the GPU.)	NV-GPU-01		Critical	See Recommended Action A below.

Table 1 – continued from previous page

Message and details	Alert ID	Component ID	Severity	Recommended Action
GPU{} power Limits are not configured correctly (Expected limits (Power: 200000W, CLock: 1597MHz), Actual limits (Power: 200000W, Clock: 1163MHz).)	NV-GPU-02		Critical	See Recommended Action A below.
System entered degraded mode, {ID} is reporting an error. (Link speed degradation observed between { BDF1, BDF2}, expected link speed is {} actual link speed is {})	NV-PCI-01		Warning	See Recommended Action A below.
System entered degraded mode, {ID} is reporting an error. (Link width degradation observed between {BDF1, BDF2},, expected link width is {} actual link width is {})	NV-PCI-02		Warning	See Recommended Action A below.
System entered degraded mode, {ID} is reporting an error. (Correctable errors reported on {BDF}.)	NV-PCI-03		Warning	See Recommended Action A below.
System entered degraded mode, {ID} is reporting an error. (UnCorrectable errors reported on {BDF})	NV-PCI-04		Critical	See Recommended Action A below.
System entered degraded mode, {ID} is reporting an error. (Device is missing on {BDF})	NV-PCI-05		Critical	See Recommended Action A below.
System entered degraded mode, {ID} is reporting an error. (Device Error Reporting is disabled on {BDF} for {})	NV-PCI-06		Critical	See Recommended Action A below.
System entered degraded mode, {ID} is reporting an error. (Device is disabled on {BDF})	NV-PCI-07		Critical	See Recommended Action A below.
System entered degraded mode, Storge Controller {} is reporting an error. (Storage controller state not optimal.)	NV-CONTROLLER-01		Warning	See Recommended Action A below.

Table 1 – continued from previous page

Message and details	Alert ID	Component ID	Severity	Recommended Action
System entered degraded mode, Storge Controller {} is reporting an error. (Storage controller port connectivity issues detected.)	NV-CONTROLLER-02		Warning	See Recommended Action A below.
System entered degraded mode, Storage Controller {} is reporting an error. (Storage controller phy link speed not set to optimal.)	NV-CONTROLLER-03		Warning	See Recommended Action A below.
Link error on {}. (Network Link is down)	NV-NET-01		Warning	See Recommended Action B below.
Network traffic errors observed on {}. (Rx collision rate of {}, has crossed threshold value of {} on {}network port.)	NV-NET-02		Warning	See Recommended Action B below.
Network traffic errors observed on {}. (Tx collision rate of {}, has crossed threshold value of {} on {}network port.)	NV-NET-03		Warning	See Recommended Action B below.
Network traffic errors observed on {}. (CRC error rate of {}, has crossed threshold value of {} on {}network port.)	NV-NET-04		Critical	See Recommended Action B below.
{} is reporting an error. ({}Network port is disabled.)	NV-NET-05		Critical	See Recommended Action B below.
Ethernet interface error on port {}. ({}Ethernet health check failing with Online NVRAM test failure.)	NV-ETH-01		Critical	See Recommended Action B below.
Ethernet interface configuration error on {}. (MAC address is missing on the Ethernet interface of {}.)	NV-ETH-02		Critical	See Recommended Action B below.
IB driver error. (HCA self test reports IB driver initialization failure.)	NV-IB-01		Critical	See Recommended Action C below.

Table 1 – continued from previous page

Message and details	Alert ID	Component ID	Severity	Recommended Action
Counter errors on IB port {} ({}HCA self test on IB port reports counter error.)	NV-IB-02		Critical	See Recommended Action B below.
Configuration error on IB port {}. (GUID is missing on {}HCA.)	NV-IB-03		Critical	See Recommended Action D below.
System entered degraded mode, {} is reporting a fatal error (Critical error has been reported by the NVSwitch Id {} with SXID error {})	NV-NVSWITCH-01		Critical	See Recommended Action A below.
System entered degraded mode, {} is reporting a non fatal error (Critical error has been reported by the NVSwitch Id {} with SXID error {})	NV-NVSWITCH-02		Warning	See Recommended Action A below.

1.2.2.1 Recommended Actions

(A)

1. Run 'sudo nvsm dump health'

2. Open a case with NVIDIA Enterprise Support at this address https://nvid.nvidia.com/dashboard/

3. Attach this notification and the nvsysinfo log file from /tmp/nvsm-health- <hostname>-<timestamp>.tar.xz

(B)

1. Check the physical link connection

2. Open a case with NVIDIA Enterprise Support at https://nvid.nvidia.com/dashboard/

(C)

1. Check OFED installation troubleshooting

2. Open a case with NVIDIA Enterprise Support at this address https://nvid.nvidia.com/dashboard/

(D)

1. Check the status of the Subnet Manager

2. Open a case with NVIDIA Enterprise Support at this address https://nvid.nvidia.com/dashboard/

1.2.3. Health Monitor Policies

Users can tune certain aspects of health monitor behavior using health monitor policies. This includes details such as email related configuration for alert notification, selectively disabling devices to be monitored, etc. Details of the supported policies and how to configure them using the CLI are provided in the section *Using the NVSM CLI*.

1.3. Verifying the Installation

Before using NVSM, you can verify the installation to make sure all the services are present.

1.3.1. Verifying DSHM Services

Health monitors are part of the DGX OS image and launched by systemd when DGX boots. You can verify if all the DSHM services are up and running using the systemctl command. Below is an example of verifying whether the environmental DSHM service is functional.

```
$ sudo systemctl status nvsm-plugin-monitor-environment
```

```
nvsm-plugin-monitor-environment.service - Environmental DSHM service.
  Loaded: loaded (/user/lib/systemd/sysem/nvsm-plugin-monitor-environment.service;
→enabled; vendor preset; enabled)
  Active: active (running) since Tues 2018-09-11 15:12:06 PDT: 3h 1min ago
Main PID: 2540 (plugin-monitor-environment)
   Tasks: 1 (limit 12287)
  CGroup: /system.slice/nvsm-plugin-monitor-environment.service
          |_2540 /user/bin/python /usr/bin/plugin-monitor-environment
```

Other modules can be verified using similar commands:

To verify the storage module:

```
$ sudo systemctl status nvsm-plugin-monitor-storage
```

To verify the system module:

```
$ sudo systemctl status nvsm-plugin-monitor-system
```

To verify the environment module

```
$ sudo systemctl status nvsm-plugin-monitor-environment
```

1.3.2. Verifying NVSM Services

NVSM is part of the DGX OS image and is launched by systemd when DGX boots. The following are the services running under NVSM.

`nvsm-plugin-environment`

`nvsm-mqtt`

`nvms-plugin-memory`

`nvsm`

`nvsm-selwatcher`

You can verify if each NVSM service is up and running using the 'systemctl' command. For example, the following command verifies the memory service.

```
$ sudo systemctl status nvsm-plugin-memory
```

You can also view all the NVSM services and their status with the following command.

```
$ sudo systemctl status -all nvsm*
```

Chapter 2. Release Notes

2.1. NVSM 20.09.20 Release

NVIDIA® System Management (NVSM) is a software framework for monitoring NVIDIA DGX™ nodes in a data center. It includes active health monitoring, system alerts, and log generation. See the NVSM User Guide for more information.

NVSM Version 20.09.20 is released in March 2021.

NVSM Version 20.09.20 is provided as part of the DGX OS 5.0 software.

2.1.1. Bug Fixes

▶ [DGX A100]: On systems with encrypted rootfs, the RAID 1 array cannot be rebuilt using NVSM.

2.1.2. Known Issues

▶ [DGX A100]: `nvsm dump health` can take up to 25 minutes to complete, depending on the size of the log file.

▶ [DGX A100]: NVSM Enumerates NVSwitches as 8-13 Instead of 0-5

▶ NVSM fails to show CPU information on non-English locales

▶ [DGX-2]: NVSM does not detect downgraded GPU PCIe Link

▶ [DGX-2 KVM]: `nvidia-vm vmshow` command does not work for running VMs.

▶ configure_raid_array.py script cannot recreate RAID array after re-inserting a known good SSD.

Chapter 3. Using the NVSM CLI

NVIDIA DGX-2 servers running DGX OS version 4.0.1 or later should come with NVSM pre-installed.

NVSM CLI communicates with the privileged NVSM API server, so NVSM CLI requires superuser privileges to run. All examples given in this guide are prefixed with the "sudo" command.

3.1. Using the NVSM CLI Interactively

Starting an interactive session

The command "sudo nvsm" will start an NVSM CLI interactive session.

```
user@dgx-2:~$ sudo nvsm
[sudo] password for user:
nvsm->
```

Once at the "`nvsm->`" prompt, the user can enter NVSM CLI commands to view and manage the DGX system.

Example command

One such command is "show fans", which prints the state of all fans known to NVSM.

```
nvsm-> show fans
/chassis/localhost/thermal/fans/FAN10_F
Properties:
    Status_State = Enabled
    Status_Health = OK
    Name = FAN10_F
    MemberId = 19
    ReadingUnits = RPM
    LowerThresholdNonCritical = 5046.000
    Reading = 9802 RPM
    LowerThresholdCritical = 3596.000

    ...
    /chassis/localhost/thermal/fans/PDB_FAN4
Properties:
    Status_State = Enabled
    Status_Health = OK
    Name = PDB_FAN4
    MemberId = 23
    ReadingUnits = RPM
    LowerThresholdNonCritical = 11900.000
```

```
    Reading = 14076 RPM
    LowerThresholdCritical = 10744.000
nvsm->
```

Leaving an interactive session

To leave the NVSM CLI interactive session, use the "exit" command.

```
nvsm-> exit
user@dgx2:~$
```

3.2. Using the NVSM CLI Non-Interactively

Any NVSM CLI command can be invoked from the system shell, without starting an NVSM CLI interactive session. To do this, simply append the desired NVSM CLI command to the "sudo nvsm" command. The "show fans" command given above can be invoked directly from the system shell as follows.

```
user@dgx2:~$ sudo nvsm show fans
/chassis/localhost/thermal/fans/FAN10_F
Properties:
    Status_State = Enabled
    Status_Health = OK
    Name = FAN10_F
    MemberId = 19
    ReadingUnits = RPM
    LowerThresholdNonCritical = 5046.000
    Reading = 9802 RPM
    LowerThresholdCritical = 3596.000
...
/chassis/localhost/thermal/fans/PDB_FAN4
Properties:
    Status_State = Enabled
    Status_Health = OK
    Name = PDB_FAN4
    MemberId = 23
    ReadingUnits = RPM
    LowerThresholdNonCritical = 11900.000
    Reading = 14076 RPM
    LowerThresholdCritical = 10744.000
user@dgx2:~$
```

The output of some NVSM commands can be too large to fit on one screen, it is sometimes useful to pipe this output to a paging utility such as "less".

```
user@dgx2:~$ sudo nvsm show fans | less
```

Throughout this chapter, examples are given for both interactive and non-interactive NVSM CLI use cases. Note that these interactive and non-interactive examples are interchangeable.

3.3. Getting Help

Apart from the NVSM CLI User Guide (this document), there are many sources for finding additional help for NVSM CLI and the related NVSM tools.

3.3.1. nvsm "man" Page

A man page for NVSM CLI is included on DGX systems with NVSM installed. The user can view this man page by invoking the "man nvsm" command.

```
user@dgx2:~$ man nvsm
```

3.3.2. nvsm –help Flag

By passing the –help flag, the nvsm command itself will print a short description of the command line arguments it recognizes. These arguments affect the behavior of the NVSM CLI interactive session, such as inclusion of color or log messages.

```
user@dgx2:~$ nvsm --help
usage: nvsm [-h] [--color WHEN] [-i] [--] [<command>...]
NVIDIA System Management interface
optional arguments:
  -h, --help            show this help message and exit
  --color WHEN          Control colorization of output. Possible
                        values for WHEN are "always", "never", or
                        "auto". Default value is "auto".
  -i, --interactive     When this option is given, run in
                        interactive mode. The default is
                        automatic.
  --log-level {debug,info,warning,error,critical}
                        Set the output logging level. Default is
                        'warning'.
```

3.3.3. Help for NVSM CLI Commands

Each NVSM command within the NVSM CLI interactive session, such as show, set, and exit, recognizes a "-help" flag that describes the NVSM command and its arguments.

```
user@dgx2:~$ sudo nvsm
nvsm-> exit -help
usage: exit [-help]

Leave the NVSM shell.

optional arguments:
  -help, -h  show this help message and exit
```

3.4. Examining System Health

The most basic functionality of NVSM CLI is examination of system state. NVSM CLI provides a "show" command for this purpose.

Because NVSM CLI is modeled after the SMASH CLP, the output of the NVSM CLI "show" command should be familiar to users of BMC command line interfaces.

3.4.1. List of Basic Commands

The following table lists the basic commands (primarily "show"). Detailed use of these commands are explained in subsequent sections of the document.

Note: On DGX Station, the following are the only commands supported.

▶ `nvsm show health`

▶ `nvsm dump health`

Global Commands	Descriptions
$ sudo nvsm show alerts	Displays warnings and critical alerts for all subsystems
$ sudo nvsm show policy	Displays alert policies for subsystems
$ sudo nvsm show versions	Displays system version properties

Health Commands	Descriptions
$ sudo nvsm show health	Displays overall system health
$ sudo nvsm dump health	Generates a health report file

Storage Commands	Descriptions
$ sudo nvsm show storage	Displays all storage-related information
$ sudo nvsm show drives	Displays the storage drives
$ sudo nvsm show volumes	Displays the storage volumes

GPU Commands	Descriptions
$ sudo nvsm show gpus	Displays informatin for all GPUs in the system.

Processor Commands	Descriptions
$ sudo nvsm show processors	Displays information for all CPUs in the system
$ sudo nvsm show cpus	Alias for "show processors"

Memory Commands	Descriptions
$ sudo nvsm show memory	Displays information for all installed DIMMs
$ sudo nvsm show dimms	Alias for "show memory"

Thermal Commands	Descriptions
$ sudo nvsm show fans	Displays information for all the fans in the system.
$ sudo nvsm show temperatures	Displays temperature information for all sensors in the system
$ sudo nvsm show temps	Alias for "show temperatures"

Network Commands	Descriptions
$ sudo nvsm show networkadapters	Displays information for the physical network adapters
$ sudo nvsm show networkinterfaces	Displays information for the logical network interfaces
$ sudo nvsm show networkports	Displays information for the network ports of a given network adapter
$ sudo nvsm show networkdevicefunctions	Displays information for the PCIe functions for a given network adapter

Power Commands	Descriptions
$ sudo nvsm show power	Displays information for all power supply units (PSUs) in the system.
$ sudo nvsm show powermode	Display the current system power mode
$ sudo nvsm show psus	Alias for "show power"

NVSwitch Commands	Descriptions
$ sudo nvsm show nvswitches	Displays information for all the NVSwitch interconnects in the system.

Firmware Commands	Descriptions
$ sudo nvsm show firmware	Guides you through the steps of selecting a firmware update container on your local DGX system, and running it to show the firmware versions installed on the system. This requires that you have already loaded the container onto the DGX system.
$ sudo nvsm update firmware	Guides you through the steps of selecting a firmware update container on your local DGX system, and running it to update the firmware on the system. This requires that you have already loaded the container onto the DGX system.

3.4.2. Show Health

The "show health" command can be used to quickly assess overall system health.

```
user@dgx-2:~$ sudo nvsm show health
```

Example output:

```
...
Checks
------Verify installed DIMM memory sticks.........................
HealthyNumber of logical CPU cores [96]..............................
HealthyGPU link speed [0000:39:00.0][8GT/s]..........................
HealthyGPU link width [0000:39:00.0][x16]...........................
Healthy
...
Health Summary
--------------
205 out of 205 checks are Healthy
Overall system status is Healthy
```

If any system health problems are found, this will be reflected in the health summary at the bottom of the "show health" output". Detailed information on health checks performed will appear above.

3.4.3. Dump Health

The "dump health" command produces a health report file suitable for attaching to support tickets.

```
user@dgx-2:~$ sudo nvsm dump health
```

Example output:

```
Writing output to /tmp/nvsm-health-dgx-1-20180907085048.tar.xzDone.
```

The file produced by "dump health" is a familiar compressed tar archive, and its contents can be examined by using the "tar" command as shown in the following example.

```
user@dgx-2:~$ cd /tmp
user@dgx-2:/tmp$ sudo tar xlf nvsm-health-dgx-1-20180907085048.tar.xz
user@dgx-2:/tmp$ sudo ls ./nvsm-health-dgx-1-20180907085048
date            java         nvsysinfo_commands  sos_reports
df              last         nvsysinfo_log.txt   sos_strings
dmidecode       lib          proc                sys
etc             lsb-release  ps                  uname
free            lsmod        pstree              uptime
hostname        lsof         route               usr
initctl         lspci        run                 var
installed-debs  mount        sos_commands        version.txt
ip_addr         netstat      sos_logs            vgdisplay
```

3.4.4. Show Storage

NVSM CLI provides a "show storage" command to view all storage-related information. This command can be invoked from the command line as follows.

```
user@dgx-2:~$ sudo nvsm show storage
```

Alternatively, the "show drives" and "show volumes" NVSM commands will show the storage drives or storage volumes respectively.

```
user@dgx-2:~$ sudo nvsm show drives
...
user@dgx-2:~$ sudo nvsm show volumes
...
```

Within an NVSM CLI interactive session, the CLI targets related to storage are located under the /systems/localhost/storage/1 target.

```
user@dgx2:~$ sudo nvsm
nvsm-> cd /systems/localhost/storage/
nvsm(/systems/localhost/storage/)-> show
```

Example output:

```
/systems/localhost/storage/
Properties:
    DriveCount = 10
    Volumes = [ md0, md1, nvme0n1p1, nvme1n1p1 ]
Targets:
    alerts
    drives
    policy
    volumes
Verbs:
    cd
    show
```

3.4.4.1 Show Storage Alerts

Storage alerts are generated when the DSHM monitoring daemon detects a storage-related problem and attempts to alert the user (via email or otherwise). Past storage alerts can be viewed within an NVSM CLI interactive session under the /systems/localhost/storage/1/alerts target.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /systems/localhost/storage/alerts
nvsm(/systems/localhost/storage/alerts)-> show
```

Example output:

```
/systems/localhost/storage/alerts
Targets:
    alert0
    alert1
Verbs:
    cd
    show
```

In this example listing, there appear to be two storage alerts associated with this system. The contents of these alerts can be viewed with the "show" command.

For example:

```
nvsm(/systems/localhost/storage/alerts)-> show alert1
```

```
/systems/localhost/storage/alerts/alert1
Properties:
    system_name = dgx-2
    message_details = EFI System Partition 1 is corrupted
nvme0n1p1
    component_id = nvme0n1p1
    description = Storage sub-system is reporting an error
    event_time = 2018-07-14 12:51:19
    recommended_action =
        1. Please run nvsysinfo
        2. Please open a case with NVIDIA Enterprise Support at this address https://
→nvid.nvidia.com/enterpriselogin
        3. Attach this notification and the nvsysinfo log file from /tmp/nvsysinfo-
→XYZ*
    alert_id = NV-VOL-03
    system_serial = productserial
    message = System entered degraded mode, storage sub-system is reporting an error
    severity = Warning
Verbs:
    cd
    show
```

The message seen in this alert suggests a possible EFI partition corruption, which is an error condition that might adversely affect this system's ability to boot. Note that the text seen here reflects the exact message that the user would have seen when this alert was generated.

Possible categories for storage alerts are given in the table below.

Alert ID	Severity	Details
NV-DRIVE-01	Critical	Drive missing
NV-DRIVE-02	Warning	Media errors detected in drive
NV-DRIVE-03	Warning	IO errors detected in drive
NV-DRIVE-04	Critical	NVMe controller failure detected in drive
NV-DRIVE-05	Warning	Available spare block percentage is below critical threshold of ten percent
NV-DRIVE-06	Warning	NVM subsystem usage exceeded ninety percent
NV-DRIVE-07	Warning	System has unsupported drive
NV-VOL-01	Critical	RAID-0 corruption observed
NV-VOL-02	Critical	RAID-1 corruption observed
NV-VOL-03	Warning	EFI System Partition 1 corruption observed
NV-VOL-04	Warning	EFI System Partition 2 corruption observed

3.4.4.2 Show Storage Drives

Within an NVSM CLI interactive session, each storage drive on the system is represented by a target under the /systems/localhost/storage/drives target. A listing of drives can be obtained as follows.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /systems/localhost/storage/drives
nvsm(/systems/localhost/storage/drives)-> show
```

Example output:

```
/systems/localhost/storage/drives
Targets:
    nvme0n1
    nvme1n1
    nvme2n1
    nvme3n1
    nvme4n1
    nvme5n1
    nvme6n1
    nvme7n1
    nvme8n1
    nvme9n1
Verbs:
    cd
    show
```

Details for any particular drive can be viewed with the "show" command.

For example:

```
nvsm(/systems/localhost/storage/drives)-> show nvme2n1
```

```
/systems/localhost/storage/drives/nvme2n1
Properties:
    Capacity = 3840755982336
    BlockSizeBytes = 7501476528
    SerialNumber = 18141C244707
    PartNumber = N/A
    Model = Micron_9200_MTFDHAL3T8TCT
    Revision = 100007C0
    Manufacturer = Micron Technology Inc
    Status_State = Enabled
    Status_Health = OK
    Name = Non-Volatile Memory Express
    MediaType = SSD
    IndicatorLED = N/A
    EncryptionStatus = N/A
    HotSpareType = N/A
    Protocol = NVMe
    NegotiatedSpeedsGbs = 0
    Id = 2
Verbs:
    cd
    show
```

3.4.4.3 Show Storage Volumes

Within an NVSM CLI interactive session, each storage volume on the system is represented by a target under the /systems/localhost/storage/volumes target. A listing of volumes can be obtained as follows.

```
user@dgx-2:~$ sudo nvsm

nvsmnvsm-> cd /systems/localhost/storage/volumes
nvsm(/systems/localhost/storage/volumes)-> show
```

Example output:

```
/systems/localhost/storage/volumes
Targets:
    md0
    md1
    nvme0n1p1
    nvme1n1p1
Verbs:
    cd
    show
```

Details for any particular volume can be viewed with the "show" command.

For example:

```
nvsm(/systems/localhost/storage/volumes)-> show md0
```

```
/systems/localhost/storage/volumes/md0P
roperties:
    Status_State = Enabled
    Status_Health = OK
    Name = md0
```

```
    Encrypted = False
    VolumeType = RAID-1
    Drives = [ nvme0n1, nvme1n1 ]
    CapacityBytes = 893.6G
    Id = md0
Verbs:
    cd
    show
```

3.4.5. Show GPUs

Information for all GPUs installed on the system can be viewed invoking the "show gpus" command as follows.

```
user@dgx-2:~$ sudo nvsm show gpus
```

Within an NVSM CLI interactive session, the same information can be accessed under the /systems/localhost/gpus CLI target.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /systems/localhost/gpus
nvsm(/systems/localhost/gpus)-> show
```

Example output:

```
/systems/localhost/gpus
Targets:
    0
    1
    2
    3
    4
    5
    6
    7
    8
    9
    10
    11
    12
    13
    14
    15
Verbs:
    cd
    show
```

Details for any particular GPU can also be viewed with the "show" command.

For example:

```
nvsm(/systems/localhost/gpus)-> show 6
/systems/localhost/gpus/6
Properties:
```

```
    Inventory_ModelName = Tesla V100-SXM3-32GB
    Inventory_UUID = GPU-4c653056-0d6e-df7d-19c0-4663d6745b97
    Inventory_SerialNumber = 0332318503073
    Inventory_PCIeDeviceId = 1DB810DE
    Inventory_PCIeSubSystemId = 12AB10DE
    Inventory_BrandName = Tesla
    Inventory_PartNumber = 699-2G504-0200-000
Verbs:
    cd
    show
```

3.4.5.1 Showing Individual GPUs

Details for any particular GPU can also be viewed with the "show" command.

For example:

```
   nvsm(/systems/localhost/gpus)-> show GPU6
/systems/localhost/gpus/GPU6
Properties:
    Inventory_ModelName = Tesla V100-SXM3-32GB
    Inventory_UUID = GPU-4c653056-0d6e-df7d-19c0-4663d6745b97
    Inventory_SerialNumber = 0332318503073
    Inventory_PCIeDeviceId = 1DB810DE
    Inventory_PCIeSubSystemId = 12AB10DE
    Inventory_BrandName = Tesla
    Inventory_PartNumber = 699-2G504-0200-000
    Specifications_MaxPCIeGen = 3
    Specifications_MaxPCIeLinkWidth = 16x
    Specifications_MaxSpeeds_GraphicsClock = 1597 MHz
    Specifications_MaxSpeeds_MemClock = 958 MHz
    Specifications_MaxSpeeds_SMClock = 1597 MHz
    Specifications_MaxSpeeds_VideoClock = 1432 MHz
    Connections_PCIeGen = 3
    Connections_PCIeLinkWidth = 16x
    Connections_PCIeLocation = 00000000:34:00.0
    Power_PowerDraw = 50.95 W
    Stats_ErrorStats_ECCMode = Enabled
    Stats_FrameBufferMemoryUsage_Free = 32510 MiB
    Stats_FrameBufferMemoryUsage_Total = 32510 MiB
    Stats_FrameBufferMemoryUsage_Used = 0 MiB
    Stats_PCIeRxThroughput = 0 KB/s
    Stats_PCIeTxThroughput = 0 KB/s
    Stats_PerformanceState = P0
    Stats_UtilDecoder = 0 %
    Stats_UtilEncoder = 0 %
    Stats_UtilGPU = 0 %
    Stats_UtilMemory = 0 %
    Status_Health = OK
Verbs:
    cd
    show
```

3.4.5.2 Identifying GPU Health Incidents

Explain the benefits of the task, the purpose of the task, who should perform the task, and when to perform the task in 50 words or fewer.

NVSM uses NVIDIA Data Center GPU Manager (DCGM) to continuously monitor GPU health, and reports GPU health issues as "GPU health incidents". Whenever GPU health incidents are present, NVSM indicates this state in the "`Status_HealthRollup`" property of the `/systems/localhost/gpus` CLI target.

"`Status_HealthRollup`" captures the overall health of all GPUs in the system in a single value. Check the "`Status_HealthRollup`" property before checking other properties when checking for GPU health incidents.

To check for GPU health incidents, do the following,

1. Display the "Properties" section of GPU health

```
~$ sudo nvsm
nvsm-> cd /systems/localhost/gpus
nvsm(/systems/localhost/gpus)-> show -display properties
```

A system with a GPU-related issue might report the following.

```
Properties:
    Status_HealthRollup = Critical
    Status_Health = OK
```

The "`Status_Health = OK`" property in this example indicates that NVSM did not find any system-level problems, such as missing drivers or incorrect device file permissions.

The "`Status_HealthRollup = Critical`" property indicates that at least one GPU in this system is exhibiting a "Critical" health incident.

2. To find this GPU, issue the following command to list the health status for each GPU..

```
~$ sudo nvsm
nvsm-> show -display properties=*health /systems/localhost/gpus/*
```

The GPU with the health incidents will be reported as in the following example for GPU14.

```
/systems/localhost/gpus/GPU14
Properties:
    Status_Health = Critica
```

3. Issue the following command to show the detailed health information for a particular GPU (GPU14 in this example).

```
nvsm-> cd /systems/localhost/gpus
nvsm(/systems/localhost/gpus)-> show -level all GPU14/health
```

The output shows all the incidents involving that particular GPU.

```
/systems/localhost/gpus/GPU14/health
Properties:
    Health = Critical
Targets:
    incident0
Verbs:
```

```
    cd
    show/systems/localhost/gpus/GPU2/health/incident0
Properties:
    Message = GPU 14's NvLink link 2 is currently down.
    Health = Critical
    System = NVLink
Verbs:
    cd
    show
```

The output in this example narrows down the scope to a specific incident (or incidents) on a specific GPU. DCGM will monitor for a variety of GPU conditions, so check "`Status_HealthRollup`" using NVSM CLI to understand each incident.

3.4.6. Show Processors

Information for all CPUs installed on the system can be viewed using the "show processors" command.

```
user@dgx-2$ sudo nvsm show processors
```

From within an NVSM CLI interactive session, the same information is available under the /systems/localhost/processors target.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /systems/localhost/processors
nvsm(/systems/localhost/processors)-> show
```

Example output:

```
/systems/localhost/processors
Targets:
    CPU0
    CPU1
    alerts
    policy
Verbs:
    cd
    show
```

Details for any particular CPU can be viewed using the "show" command.

For example:

```
nvsm(/systems/localhost/processors)-> show CPU0/systems/localhost/processors/CPU0
Properties:
    Id = CPU0
    InstructionSet = x86-64
    Manufacturer = Intel(R) Corporation
    MaxSpeedMHz = 3600
    Model = Intel(R) Xeon(R) Platinum 8168 CPU @ 2.70GHz
    Name = Central Processor
    ProcessorArchitecture = x86
    ProcessorId_EffectiveFamily = 6
    ProcessorId_EffectiveModel = 85
```

```
    ProcessorId_IdentificationRegisters = 0xBFEBFBFF00050654
    ProcessorId_Step = 4
    ProcessorId_VendorId = GenuineIntel
    ProcessorType = CPU
    Socket = CPU 0
    Status_Health = OK
    Status_State = Enabled
    TotalCores = 24
    TotalThreads = 48
Verbs:
    cd
    show
```

3.4.6.1 Show Processor Alerts

Processor alerts are generated when the DSHM monitoring daemon detects a CPU Internal Error (IERR) or Thermal Trip and attempts to alert the user (via email or otherwise). Past processor alerts can be viewed within an NVSM CLI interactive session under the /systems/localhost/processors/alerts target.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /systems/localhost/processors/alerts
nvsm(/systems/localhost/processors/alerts)-> show
```

Example output:

```
/systems/localhost/processors/alerts
Targets:
    alert0
    alert1
    alert2
Verbs:
    cd
    show
```

This example listing appears to show three processor alerts associated with this system. The contents of these alerts can be viewed with the "show" command.

For example:

```
nvsm(/systems/localhost/processors/alerts)-> show alert2
```

```
/systems/localhost/processors/alerts/alert2
Properties:
    system_name = xpl-bu-06
    component_id = CPU0
    description = CPU is reporting an error.
    event_time = 2018-07-18T16:42:20.580050
    recommended_action =
    1. Please run nvsysinfo
    2. Please open a case with NVIDIA Enterprise Support at this address https://
→nvid.nvidia.com/enterpriselogin
    3. Attach this notification and the nvsysinfo log file from /tmp/nvsysinfo-XYZ*
    severity = Critical
    alert_id = NV-CPU-02
    system_serial = To be filled by O.E.M.
```

```
    message = System entered degraded mode, CPU0 is reporting an error.
    message_details = CPU Thermtrip has occurred, processor socket temperature
→exceeded the thermal specifications of the component.
Verbs:
    cd
    show
```

Possible categories for processor alerts are given in the table below.

Alert ID	Severity	Details
NV-CPU-01	Critical	An unrecoverable CPU Internal error has occurred.
NV-CPU-02	Critical	CPU Thermtrip has occurred, processor socket temperature exceeded the thermal specifications of the component.

3.4.7. Show Memory

Information for all system memory (i.e. all DIMMs installed near the CPU, not including GPU memory) can be viewed using the "show memory" command.

```
user@dgx-2:~$ sudo nvsm show memory
```

From within an NVSM CLI interactive session, system memory information is accessible under the /systems/localhost/memory target.

```
lab@xpl-dvt-42:~$ sudo nvsm
nvsm-> cd /systems/localhost/memory
nvsm(/systems/localhost/memory)-> show
```

Example output:

```
/systems/localhost/memory
Targets:
    CPU0_DIMM_A1
    CPU0_DIMM_A2
    CPU0_DIMM_B1
    CPU0_DIMM_B2
    CPU0_DIMM_C1
    CPU0_DIMM_C2
    CPU0_DIMM_D1
    CPU0_DIMM_D2
    CPU0_DIMM_E1
    CPU0_DIMM_E2
    CPU0_DIMM_F1
    CPU0_DIMM_F2
    CPU1_DIMM_G1
    CPU1_DIMM_G2
    CPU1_DIMM_H1
    CPU1_DIMM_H2
    CPU1_DIMM_I1
    CPU1_DIMM_I2
```

```
    CPU1_DIMM_J1
    CPU1_DIMM_J2
    CPU1_DIMM_K1
    CPU1_DIMM_K2
    CPU1_DIMM_L1
    CPU1_DIMM_L2
    alerts     policy
Verbs:
    cd
    show
```

Details for any particular memory DIMM can be viewed using the "show" command.

For example:

```
nvsm(/systems/localhost/memory)-> show CPU2_DIMM_B1
```

```
/systems/localhost/memory/CPU2_DIMM_B1
Properties:
    CapacityMiB = 65536
    DataWidthBits = 64
    Description = DIMM DDR4 Synchronous
    Id = CPU2_DIMM_B1
    Name = Memory Instance
    OperatingSpeedMhz = 2666
    PartNumber = 72ASS8G72LZ-2G6B2
    SerialNumber = 1CD83000
    Status_Health = OK
    Status_State = Enabled
    VendorId = Micron
Verbs:
    cd
    show
```

3.4.7.1 Show Memory Alerts

On DGX systems with a Baseboard Management Controller (BMC), the BMC will monitor DIMMs for correctable and uncorrectable errors. Whenever memory error counts cross a certain threshold (as determined by SBIOS), a memory alert is generated by the DSHM daemon in an attempt to notify the user (via email or otherwise).

Past memory alerts are accessible from an NVSM CLI interactive session under the /systems/localhost/memory/alerts target.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /systems/localhost/memory/alerts
nvsm(/systems/localhost/memory/alerts)-> show
```

Example output:

```
/systems/localhost/memory/alerts
Targets:
    alert0
Verbs:
```

```
    cd
    show
```

This example listing appears to show one memory alert associated with this system. The contents of this alert can be viewed with the "show" command.

For example:

```
nvsm(/systems/localhost/memory/alerts)-> show alert0
```

```
/systems/localhost/memory/alerts/alert0
Properties:
    system_name = xpl-bu-06
    component_id = CPU1_DIMM_A2
    description = DIMM is reporting an error.
    event_time = 2018-07-18T16:48:09.906572
    recommended_action =
        1. Please run nvsysinfo
        2. Please open a case with NVIDIA Enterprise Support at this address https://
→nvid.nvidia.com/enterpriselogin
        3. Attach this notification and the nvsysinfo log file from /tmp/nvsysinfo-XYZ*
    severity = Critical
    alert_id = NV-DIMM-01
    system_serial = To be filled by O.E.M.
    message = System entered degraded mode, CPU1_DIMM_A2 is reporting an error.
    message_details = Uncorrectable error is reported.
Verbs:
    cd
    show
```

Possible categories for memory alerts are given in the table below.

Alert Type	Severity	Details
NV-DIMM-01	Critical	Uncorrectable error is reported.

3.4.8. Show Fans and Temperature

NVSM CLI provides a "show fans" command to display information for each fan on the system.

```
~$ sudo nvsm show fans
```

Likewise, NVSM CLI provides a "show temperatures" command to display temperature information for each temperature sensor known to NVSM.

```
~$ sudo nvsm show temperatures
```

Within an NVSM CLI interactive session, targets related to fans and temperature are located under the /chassis/localhost/thermal target.

```
~$ sudo nvsm
nvsm-> cd /chassis/localhost/thermal
nvsm(/chassis/localhost/thermal)-> show
```

Example output:

```
/chassis/localhost/thermal
Targets:
    alerts
    fans
    policy
    temperatures
Verbs:
    cd
    show
```

3.4.8.1 Show Thermal Alerts

The DSHM daemon monitors fan speed and temperature sensors. When the values of these sensors violate certain threshold criteria, DSHM generates a thermal alert in an attempt to notify the user (via email or otherwise).

Past thermal alerts can be viewed in an NVSM CLI interactive session under the /chassis/localhost/thermal/alerts target.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /chassis/localhost/thermal/alerts
nvsm(/chassis/localhost/thermal/alerts)-> show
```

Example output:

```
/chassis/localhost/thermal/alerts
Targets:
    alert0
Verbs:
    cd
    show
```

This example listing appears to show one thermal alert associated with this system. The contents of this alert can be viewed with the "show" command.

For example:

```
nvsm(/chassis/localhost/thermal/alerts)-> show alert0
/chassis/localhost/thermal/alerts/alert0
Properties:
   system_name = system-name
   component_id = FAN1_R
   description = Fan Module is reporting an error.
   event_time = 2018-07-12T15:12:22.076814
   recommended_action =
       1. Please run nvsysinfo
       2. Please open a case with NVIDIA Enterprise Support at this address https://
→nvid.nvidia.com/enterpriselogin      3. Attach this notification and the
→nvsysinfo log file from /tmp/nvsysinfo-XYZ*
   severity = Critical
   alert_id = NV-FAN-01
   system_serial = To be filled by O.E.M.
   message = System entered degraded mode, FAN1_R is reporting an error.
   message_details = Fan speed reading has fallen below the expected speed setting.
Verbs:    cd    show
```

From the message in this alert, it appears that one of the rear fans is broken in this system. This is the exact message that the user would have received at the time this alert was generated, assuming alert notifications were enabled.

Possible categories for thermal-related (fan and temperature) alerts are given in the table below.

Alert ID	Severity	Details
NV-FAN-01	Critical	Fan speed reading has fallen below the expected speed setting.
NV-FAN-02	Critical	Fan readings are inaccessible.
NV-PDB-01	Critical	Operating temperature exceeds the thermal specifications of the component.

3.4.8.2 Show Fans

Within an NVSM CLI interactive session, each fan on the system is represented by a target under the /chassis/localhost/thermal/fans target. The "show" command can be used to obtain a listing of fans on the system.

```
user@dgx-2:~$ sudo nvsm
```

```
nvsm-> cd /chassis/localhost/thermal/fans
```

```
nvsm(/chassis/localhost/thermal/fans)-> show
```

Example output:

```
/chassis/localhost/thermal/fans
Targets:
    FAN10_F
    FAN10_R
    FAN1_F
    FAN1_R
    FAN2_F
    FAN2_R
    FAN3_F
    FAN3_R
    FAN4_F
    FAN4_R
    FAN5_F
    FAN5_R
    FAN6_F
    FAN6_R
    FAN7_F
    FAN7_R
    FAN8_F
    FAN8_R
    FAN9_F
    FAN9_R
    PDB_FAN1
    PDB_FAN2
    PDB_FAN3
```

```
      PDB_FAN4
Verbs:
    cd
    show
```

Again using the "show" command, the details for any given fan can be obtained as follows.

For example:

```
nvsm(/chassis/localhost/thermal/fans)-> show PDB_FAN2
/chassis/localhost/thermal/fans/PDB_FAN2
Properties:
    Status_State = Enabled
    Status_Health = OK
    Name = PDB_FAN2
    MemberId = 21
    ReadingUnits = RPM
    LowerThresholdNonCritical = 11900.000
    Reading = 13804 RPM
    LowerThresholdCritical = 10744.000
Verbs:
    cd
    show
```

3.4.8.3 Show Temperatures

Each temperature sensor known to NVSM is represented as a target under the /chassis/localhost/thermal/temperatures target. A listing of temperature sensors on the system can be obtained using the following commands.

```
nvsm(/chassis/localhost/thermal/temperatures)-> show
```

Example output:

```
/chassis/localhost/thermal/temperatures
Targets:
    PDB1
    PDB2
Verbs:
    cd
    show
```

As with fans, the details for any temperature sensor can be viewed with the "show" command.

For example:

```
nvsm(/chassis/localhost/thermal/temperatures)-> show PDB2
/chassis/localhost/thermal/temperatures/PDB2
Properties:
    Status_State = Enabled
    Status_Health = OK
    Name = PDB2
    PhysicalContext = PDB
    MemberId = 1
    ReadingCelsius = 20 degrees C
```

```
    UpperThresholdNonCritical = 127.000
    SensorNumber = 66h
    UpperThresholdCritical = 127.000
Verbs:
    cd
    show
```

3.4.9. Show Power Supplies

NVSM CLI provides a "show power" command to display information for all power supplies present on the system.

```
user@dgx-2:~$ sudo nvsm show power
```

From an NVSM CLI interactive session, power supply information can be found under the /chassis/localhost/power target.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /chassis/localhost/power
nvsm(/chassis/localhost/power)-> show
```

Example output:

```
/chassis/localhost/power
Targets:
    PSU1
    PSU2
    PSU3
    PSU4
    PSU5
    PSU6
    alerts      policyVerbs:    cd      show
```

Details for any particular power supply can be viewed using the "show" command as follows.

For example:

```
nvsm(/chassis/localhost/power)-> show PSU4
```

```
/chassis/localhost/power/PSU4
Properties:
    Status_State = Present
    Status_Health = OK
    LastPowerOutputWatts = 442
    Name = PSU4
    SerialNumber = DTHTCD18240
    MemberId = 3
    PowerSupplyType = AC
    Model = ECD16010081
    Manufacturer = Delta
Verbs:
    cd
    show
```

3.4.9.1 Show Power Alerts

The DSHM daemon monitors PSU status. When the PSU status is not Ok, DSHM generates a power alert in an attempt to notify the user (via email or otherwise).

Prior power alerts can be viewed under the /chassis/localhost/power/alerts target of an NVSM CLI interactive session.

```
user@dgx-2:~$ sudo nvsm
nvsm-> cd /chassis/localhost/power/alerts
nvsm(/chassis/localhost/power/alerts)-> show
```

Example output:

```
/chassis/localhost/power/alerts
Targets:
    alert0
    alert1
    alert2
    alert3
    alert4
Verbs:
    cd
    show
```

This example listing shows a system with five prior power alerts. The details for any one of these alerts can be viewed using the "show" command.

For example:

```
nvsm(/chassis/localhost/power/alerts)-> show alert4
/chassis/localhost/power/alerts/alert4
Properties:
   system_name = system-name
   component_id = PSU4
   description = PSU is reporting an error.
   event_time = 2018-07-18T16:01:27.462005
   recommended_action =
       1. Please run nvsysinfo
       2. Please open a case with NVIDIA Enterprise Support at this address https://
→nvid.nvidia.com/enterpriselogin
       3. Attach this notification and the nvsysinfo log file from /tmp/nvsysinfo-XYZ*
   severity = Warning
   alert_id = NV-PSU-05
   system_serial = To be filled by O.E.M.
   message = System entered degraded mode, PSU4 is reporting an error.
   message_details = PSU is missing
Verbs:
    cd
    show
```

Possible categories for power alerts are given in the table below.

Alert ID	Severity	Details
NV-PSU-01	Critical	Power supply module has failed.
NV-PSU-02	Warning	Detected predictive failure of the Power supply module.
NV-PSU-03	Critical	Input to the Power supply module is missing.
NV-PSU-04	Critical	Input voltage is out of range for the Power Supply Module.
NV-PSU-05	Warning	PSU is missing

3.5. Show Network Adapters

NVSM CLI provides a "show networkadapters" command to display information for each physical network adapter in the chassis.

```
~$ sudo nvsm show networkadapters
```

Within an NVSM CLI interactive session, targets related to network adapters are located under the /chassis/localhost/NetworkAdapters target.

```
~$ sudo nvsm
nvsm-> cd /chassis/localhost/NetworkAdapters
nvsm(/chassis/localhost/NetworkAdapters)-> show
```

3.5.1. Show Network Ports

NVSM CLI provides a "show networkports" command to display information for each physical network port in the chassis.

```
~$ sudo nvsm show networkports
```

Within an NVSM CLI interactive session, targets related to network adapters are located under the /chassis/localhost/NetworkAdapter/<id>/NetworkPort target, where <id> is one of the network adapter IDs displayed from the nvsm show networkadapters command.

```
~$ sudo nvsm
nvsm-> cd /chassis/localhost/NetworkAdapters/<id>/NetworkPorts
nvsm(/chassis/localhost/NetworkAdapters/<id>/NetworkPorts)-> show
```

3.5.2. Show Network Device Functions

NVSM CLI provides a "show networkdevicefunctions" command to display information for each network adapter-centric PCIe function in the chassis.

```
~$ sudo nvsm show networkdevicefunctions
```

Within an NVSM CLI interactive session, targets related to network adevice functions are located under the /chassis/localhost/NetworkAdapter/<id>/NetworkDeviceFunctions target, where <id> is one of the network adapter IDs displayed from the `nvsm show networkadapters` command..

```
~$ sudo nvsm
nvsm-> cd /chassis/localhost/NetworkAdapters/<id>/NetworkDeviceFunctions
nvsm(/chassis/localhost/NetworkAdapters/<id>/NetworkDeviceFunctions)-> show
```

3.5.3. Show Network Interfaces

NVSM CLI provides a "show networkinterfaces" command to display information for each logical network adapter on the system.

```
~$ sudo nvsm show networkinterfaces
```

Within an NVSM CLI interactive session, targets related to network adapters are located under the /system/localhost/networkinterfaces target.

```
~$ sudo nvsm
nvsm-> cd /system/localhost/NetworkInterfaces
nvsm(/system/localhost/NetworkInterfaces)-> show
```

3.6. System Monitoring Configuration

NVSM provides a DSHM service that monitors the state of the DGX system.

NVSM CLI can be used to interact with the DSHM system monitoring service via the NVSM API server.

3.6.1. Configuring Email Alerts

In order to receive the Alerts generated by DSHM through email, configure the Email settings in the global policy using NVSM CLI. User shall receive email whenever a new alert gets generated. The sender address, recipient address(es), SMTP server IP address and SMTP server Port number must be configured according to the SMTP server settings hosted by the user.

Email configuration properties

Property	Description
email_sender	Sender email address Must be a valid email address, otherwise no emails will be sent. [sender@domain.com]
email_recipients	List of recipients to which the email shall be sent [user1@domain.com,user2@domain.com]
email_smtp_server_name	SMTP server name that the user wants to use for relaying email [smtp.domain.com]
email_smtp_server_port	Port Number used by the SMTP server for providing SMTP relay service. Numeric value

The following examples illustrate how to configure email settings in global policy using NVSM CLI.

```
user@dgx-2:~$sudo nvsm set /policy email_sender=dgx-admin@nvidia.com
```

```
user@dgx-2:~$sudo nvsm set /policy email_smtp_server_name=smtpserver.nvidia.com
```

```
user@dgx-2:~$sudo nvsm set /policy email_recipients=jdoe@nvidia.com,jdeer@nvidia.com
```

```
user@dgx-2:~$sudo nvsm set /policy email_smtp_server_port=465
```

3.6.2. Understanding System Monitoring Policies

From within an NVSM CLI interactive session, system monitor policy settings are accessible under the following targets.

CLI Target	Description
/policy	Global NVSM monitoring policy, such as email settings for alert notifications.
/systems/localhost/gpus/policy	
/systems/localhost/memory/policy	NVSM policy for monitoring DIMM correctable and uncorrectable errors.
/systems/localhost/processors/policy	NVSM policy for monitoring CPU machine-check exceptions (MCE)
/systems/localhost/storage/policy	NVSM policy for monitoring storage drives and volumes
/chassis/policy	
/chassis/localhost/thermal/policy	NVSM policy for monitoring fan speed and temperature as reported by the baseboard management controller (BMC)
/chassis/localhost/power/policy	NVSM policy for monitoring power supply voltages as reported by the BMC
/chassis/localhost/NetworkAdaptors/policy	NVSM policy for monitoring the physical network adapters
/chassis/localhost/NetworkAdaptors/<ETH *x* >/NetworkPorts/policy	NVSM policy for monitoring the network ports for the specified Ethernet network adapter
/chassis/localhost/NetworkAdaptors/<IB *y* >/NetworkPorts/policy	NVSM policy for monitoring the network ports for the specified InfiniBand network adapter
/chassis/localhost/NetworkAdaptors/<ETH *x* >/NetworkDevicesFunctions/policy	NVSM policy for monitoring the PCIe functions for the specified Ethernet network adapter
/chassis/localhost/NetworkAdaptors/<IB *y* >/NetworkDevicesFunctions/policy	NVSM policy for monitoring the PCIe functions for the specified InfiniBand network adapter

3.6.2.1 Global Monitoring Policy

Global monitoring policy is represented by the /policy target of NVSM CLI.

```
user@dgx-2:~$ sudo nvsm show /policy
```

Example output:

```
/policy
Properties:
    email_sender = NVIDIA DSHM Service
    email_smtp_server_name = smtp.example.com
    email_recipients = jdoe@nvidia.com,jdeer@nvidia.com
    email_smtp_server_port = 465
Verbs:
    cd
    set
    show
```

The properties for global monitoring policy are described in the table below.

Property	Description
email_sender	Sender email address [sender@domain.com]
email_recipients	List of recipients to which the email shall be sent [user1@domain.com,user2@domain.com]
email_smtp_server_name	SMTP server name that the user wants to use for re-laying email [smtp.domain.com]
email_smtp_server_port	Port Number used by the SMTP server for providing SMTP relay service. Numeric value

3.6.2.2 Memory Monitoring Policy

Memory monitoring policy is represented by the /systems/localhost/memory/policy target of NVSM CLI.

```
user@dgx-2:~$ sudo nvsm show /systems/localhost/memory/policy
```

Example output:

```
/systems/localhost/memory/policy
Properties:
    mute_notification =
    mute_monitoring =

Verbs:
    cd
    set
    show
```

The properties for memory monitoring policy are described in the table below.

Property	Syntax	Description
mute_notification	List of comma separated DIMM IDs Example: CPU1_DIMM_A1,CPU2_DIMM_F2	Email alert notification is sup-pressed for devices in the list.
mute_monitoring	List of comma separated DIMM IDs Example: CPU1_DIMM_A1,CPU2_DIMM_F2	Health monitoring is suppressed for devices in the list.

3.6.2.3 Processor Monitoring Policy

Processor monitoring policy is represented by the /systems/localhost/processors/policy target of NVSM CLI.

```
user@dgx-2:~$ sudo nvsm show /systems/localhost/processors/policy
```

Example output:

```
/systems/localhost/processors/policy
Properties:
    mute_notification =
    mute_monitoring =

Verbs:
    cd
    set
    show
```

The properties for processor monitoring policy are described in the table below.

Property	Syntax	Description
mute_notification	List of comma separated CPU IDs. Example: CPU0,CPU1	Email alert notification is suppressed for devices in the list.
mute_monitoring	List of comma separated CPU IDs Example: CPU0,CPU1	Health monitoring is suppressed for devices in the list.

3.6.2.4 Storage Monitoring Policy

Storage monitoring policy is represented by the /systems/localhost/storage/1/policy target of NVSM CLI.

```
user@dgx-2:~$ sudo nvsm show /systems/localhost/storage/policy
```

Example output:

```
/systems/localhost/storage/policy
Properties:
    volume_mute_monitoring =
    volume_poll_interval = 10
    drive_mute_monitoring =
    drive_mute_notification =
    drive_poll_interval = 10
    volume_mute_notification =
Verbs:
    cd
    set
    show
```

The properties for storage monitoring policy are described in the table below.

Property	Syntax	Description
drive_mute_notification	List of comma separated drive slots Example: 0, 1 etc	Email alert notification is suppressed for drives in the list.
drive_mute_monitoring	List of comma separated drive slots Example: 0, 1 etc	Health monitoring is suppressed for drives in the list.
drive_poll_interval	Positive integer	DSHM checks the health of the drives periodically. By default, this polling occurs every 10 seconds. The poll interval can be configured through this property.
volume_mute_notification	List of comma separated volume identifier Example: md0, md1 etc	Email alert notification is suppressed for volumes in the list
volume_mute_monitoring	List of comma separated volume identifier Example: md0, md1 etc	Health monitoring is suppressed for volumes in the list
volume_poll_interval	Positive integer	DSHM checks the health of the volumes periodically. By default, this polling occurs every 10 seconds. The poll interval can be configured through this property.

3.6.2.5 Thermal Monitoring Policy

Thermal monitoring policy (for fan speed and temperature) is represented by the /chassis/localhost/thermal/policy target of NVSM CLI.

```
user@dgx-2:~$ sudo nvsm show /chassis/localhost/thermal/policy
```

Example output:

```
/chassis/localhost/thermal/policy
Properties:
    fan_mute_notification =
    pdb_mute_monitoring =
    fan_mute_monitoring =
    pdb_mute_notification =
Verbs:
    cd
    set
    show
```

The properties for thermal monitoring policy are described in the table below.

Property	Syntax	Description
fan_mute_notification	List of comma separated FAN IDs. Example: FAN2_R,FAN1_L,PDB_FAN2	Email alert notification is suppressed for devices in the list.
fan_mute_monitoring	List of comma separated FAN IDs Example: FAN6_F,PDB_FAN1	Health monitoring is suppressed for devices in the list.
pdb_mute_notification	List of comma separated PDB IDs. Example: PDB1,PDB2	Email alert notification is suppressed for devices in the list.
pdb_mute_monitoring	List of comma separated PDB IDs Example: PDB1	Health monitoring is suppressed for devices in the list.

3.6.2.6 Power Monitoring Policy

Power monitoring policy is represented by the /chassis/localhost/power/policy target of NVSM CLI.

```
user@dgx-2:~$ sudo nvsm show /chassis/localhost/power/policy
```

Example output:

```
/chassis/localhost/power/policy
Properties:
    mute_notification =
    mute_monitoring =

Verbs:
    cd
    set
    show
```

The properties for power monitoring policy are described in the table below.

Property	Syntax	Description
mute_notification	List of comma separated PSU IDs. Example: PSU4,PSU2	Email alert notification is suppressed for devices in the list.
mute_monitoring	List of comma separated FAN IDs Example: PSU1,PSU4	Health monitoring is suppressed for devices in the list.

3.6.2.7 PCIe Monitoring Policy

Memory monitoring policy is represented by the /systems/localhost/pcie/policy target of NVSM CLI.

```
:~$ sudo nvsm show /systems/localhost/pcie/policy
```

Example output:

```
/systems/localhost/pcie/policy
Properties:
```

```
    mute_notification =
    mute_monitoring =

Verbs:
    cd
    set
    show
```

The properties for memory monitoring policy are described in the table below.

Property	Syntax	Description
mute_notification	List of comma separated PCIe IDs	Email alert notification is suppressed for devices in the list.
mute_monitoring	List of comma separated PCIe IDs	Health monitoring is suppressed for devices in the list.

3.6.2.8 GPU Monitoring Policy

Memory monitoring policy is represented by the /systems/localhost/gpus/policy target of NVSM CLI.

```
:~$ sudo nvsm show /systems/localhost/gpus/policy
```

Example output:

```
/systems/localhost/gpus/policy
Properties:
    mute_notification =
    mute_monitoring =

Verbs:
    cd
    set
    show
```

The properties for memory monitoring policy are described in the table below.

Property	Syntax	Description
mute_notification	List of comma separated GPU IDs	Email alert notification is suppressed for devices in the list.
mute_monitoring	List of comma separated GPU IDs	Health monitoring is suppressed for devices in the list.

3.6.2.9 Network Adaptor Monitoring Policies

3.6.2.9.1 Network Adapter Policy

The physical network adapter monitoring policy is represented by the /chassis/localhost/NetworkAdaptors/policy target of NVSM CLI.

```
:~$ sudo nvsm show /chassis/localhost/NetworkAdaptors/policy
```

Example output:

```
/chassis/localhost/NetworkAdaptors/policy
Properties:
    mute_notification =
    mute_monitoring =
Verbs:
    cd
    set
    show
```

The properties are described in the following table.

Property	Syntax	Description
mute_notification	List of comma separated physical network adapter IDs.	Email alert notification is suppressed for devices in the list.
mute_monitoring	List of comma separated physical network adapter IDs.	Health monitoring is suppressed for devices in the list.

3.6.2.9.2 Network Ports Policy

The physical network port monitoring policy is represented by the /chassis/localhost/NetworkAdaptors/<network-id>/NetworkPorts/policy target of NVSM CLI.

The following uses the network port IB0 to demonstrate this command.

```
:~$ sudo nvsm show /chassis/localhost/NetworkAdaptors/IB0/NetworkPorts/policy
```

Example output:

```
/chassis/localhost/NetworkAdaptors/IB0/NetworkPorts/policy
Properties:
    mute_notification =
    mute_monitoring =
Verbs:
    cd
    set
    show
```

The properties are described in the following table.

Property	Syntax	Description
mute_notification	List of comma separated physical network port IDs.	Email alert notification is suppressed for devices in the list.
mute_monitoring	List of comma separated physical network port IDs	Health monitoring is suppressed for devices in the list.

3.6.2.9.3 Network Devices Functions Policy

The network devices functions monitoring policy is represented by the /chassis/localhost/NetworkAdaptors/<network-id>/NetworkDevicesFunctions/policy target of NVSM CLI.

The following uses the network port IB0 to demonstrate this command.

```
:~$ sudo nvsm show /chassis/localhost/NetworkAdaptors/IB0/NetworkDevicesFunctions/
→policy
```

Example output:

```
/chassis/localhost/NetworkAdaptors/IB0/NetworkDevicesFunctions/policy
Properties:
    mute_monitoring =
    mute_notification =
    rx_collision_threshold = 5
    rx_crc_threshold = 5
    tx_collision_threshold = 5
Verbs:
    cd
    set
    show
```

The properties are described in the following table.

Property	Syntax	Description
mute_notification	List of comma separated network-centric PCIe function IDs. Example: PSU4,PSU2	Email alert notification is suppressed for devices in the list.
mute_monitoring	List of comma separated network-centric PCIe function IDs. Example: PSU1,PSU4	Health monitoring is suppressed for devices in the list.
rx_collision_threshold	Positive integer	
rx_crc_threshold	Positive integer	
tx_collision_threshold	Positive integer	

3.7. Performing System Management Tasks

This section describes commands for accomplishing some system management tasks.

3.7.1. Rebuilding a RAID 1 Array

For DGX systems with two NVMe OS drives configure as a RAID 1 array, the operating system is installed on volume md0. You can use NVSM CLI to view the health of the RAID volume and then rebuild the RAID array on two healthy drives.

3.7.1.1 Viewing a Healthy RAID Volume

On a healthy system, this volume appears with two drives and "Status_Health = OK". For example:

```
 nvsm-> cd /systems/localhost/storage
nvsm(/systems/localhost/storage)-> show volumes/md0
/systems/localhost/storage/volumes/md0
Properties:
    Status_State = Enabled
    Status_Health = OK
    Name = md0
    Encrypted = False
    VolumeType = RAID-1
    Drives = [ nvme0n1, nvme1n1 ]
    CapacityBytes = 893.6G
    Id = md0
Targets:
    rebuild
Verbs:
    cd
    show
```

3.7.1.2 Viewing a Degraded RAID Volume

On a system with degraded OS volume, the md0 volume will appear with only one drive, with messages "Status_Health = Warning", and "Status_State = Degraded" reported as follows.

```
nvsm-> cd /systems/localhost/storage
nvsm(/systems/localhost/storage)-> show volumes/md0
/systems/localhost/storage/volumes/md0
Properties:
    Status_State = Degraded
    Status_Health = Warning
    Name = md0
    Encrypted = False
    VolumeType = RAID-1
    Drives = [ nvme1n1 ]
    CapacityBytes = 893.6G
    Id = md0Targets:
    rebuild
```

```
Verbs:
    cd
    show
```

In this situation, the OS volume is missing its parity drive.

3.7.1.3 Rebuilding the RAID 1 Volume

To rebuild the RAID array, make sure that you have installed a known good NVMe drive for the parity drive.

The RAID rebuilding process should begin automatically upon turning on the system. If it does not start automatically, use NVSM CLI to manually rebuild the array as follows.

1. Start an NVSM CLI interactive session and switch to the storage target.

   ```
   $ sudo nvsm
   nvsm-> cd /systems/localhost/storage
   ```

2. Start the rebuilding process and be ready to enter the device name of the replaced drive.

   ```
   nvsm(/systems/localhost/storage)-> start volumes/md0/rebuild
   PROMPT: In order to rebuild this volume, a spare drive
           is required. Please specify the spare drive to use
           to rebuild md0.
   Name of spare drive for md0 rebuild (CTRL-C to cancel): nvmeXn1
   WARNING: Once the volume rebuild process is started, the
            process cannot be stopped.
   Start RAID-1 rebuild on md0? [y/n] y
   ```

3. After entering **y** at the prompt to start the RAID 1 rebuild, the "Initiating rebuild …" message appears.

   ```
   /systems/localhost/storage/volumes/md0/rebuild started at 2018-10-12 15:27:26.
   ↪525187
    Initiating RAID-1 rebuild on volume md0...
    0.0% [\ ]
   ```

   After about 30 seconds, the "Rebuilding RAID-1 …" message should appear.

   ```
   /systems/localhost/storage/volumes/md0/rebuild started at 2018-10-12 15:27:26.
   ↪525187
    Rebuilding RAID-1 rebuild on volume md0...
    31.0% [=============/ ]
   ```

   If this message remains at "Initiating RAID-1 rebuild" for more than 30 seconds, then there is a problem with the rebuild process. In this case, make sure the name of the replacement drive is correct and try again.

The RAID 1 rebuild process should take about 1 hour to complete.

For more detailed information on replacing a failed NVMe OS drive, see the NVIDIA DGX-2 Service Manual.

3.7.2. Setting MaxQ/MaxP on DGX-2 Systems

Beginning with DGX OS 4.0.5, you can set two GPU performance modes – MaxQ or MaxP.

Note: Support on DGX-2 systems requires BMC firmware version 1.04.03 or later. MaxQ/MaxP is not supported on DGX-2H systems.

3.7.2.1 MaxQ

- ▶ Maximum efficiency mode
- ▶ Allows two DGX-2 systems to be installed in racks that have a power budget of 18 kW.
- ▶ Switch to MaxQ mode as follows.

```
$ sudo nvsm set powermode=maxq
```

The settings are preserved across reboots.

3.7.2.2 MaxP

- ▶ Default mode for maximum performance
- ▶ GPUs operate unconstrained up to the thermal design power (TDP) level.

   In this setting, the maximum DGX-2 power consumption is 10 kW.

- ▶ Provides reduced but better performance than MaxQ when only 3 or 4 PSUs are working.
- ▶ If you switch to MaxQ mode, you can switch back to MaxP mode as follows:

```
$ sudo nvsm set powermode=maxp
```

The settings are preserved across reboots.

3.7.3. Configuring Support for Custom Drive Partitioning

DGX systems incorporate data drives configured as either RAID 0 or RAID 5 arrays, depending on the product. You can alter the default configuration by adding or removing drives, or by switching between a RAID 0 configuration and a RAID 5 configuration. If you alter the default configuration, you must let NVSM know so that the utility does not flag the configuration as an error, and so that NVSM can continue to monitor the health of the drives.

To configure NVSM to support a custom drive partitioning, perform the following.

1. Stop NVSM services.

```
$ systemctl stop nvsm
```

2. Edit /etc/nvsm/nvsm.config and set the "use_standard_config_storage" parameter to false

```
"use_standard_config_storage":false
```

3. Remove the NVSM database.

```
$ sudo rm /var/lib/nvsm/sqlite/nvsm.db
```

4. Restart NVSM.

```
$ systemctl restart nvsm
```

Remember to set the parameter back to `true` if you restore the drive partition back to the default configuration.

Chapter 4. Configuring NVSM Security

This chapter explains shows how to secure the NVSM API installation.

4.1. Overview of NVSM Security

NVSM APIs are served using the HTTPS protocol. HTTPS requires the NVSM API server to possess a public-private key pair as well as a certificate that it presents to connecting clients. The certificate also needs to be signed by a certificate authority (CA) using the private key of that CA.

For proper security, this certificate+key should be provided by users. It cannot be provided by NVIDIA because

▶ The private key should be known only to the user, and should not be known to NVIDIA, and

▶ NVIDIA is not a Certificate Authority

To allow the NVSM software stack to work right out of the box, the installation process creates some sample key pairs and certificates. These certificates are created with dummy values for country, organization, organization unit, etc. because the installation does not include these details. Also, the generated CA certificate is self signed. These sample certificates must NOT be used in a production environment.

NVSM allows you to provide your own key-pairs and certificates with correct values that are properly signed by a trusted CA. Details of key generation and certificate chains is beyond the scope of this document. However, an example setup is shown below to show how NVSM can be configured with customer provided/generated keys and certificates.

4.2. What You Need to Configure NVSM Security

To configure NVSM security, you need the following, either copied from a CA provider or generated locally and copied to a location on the system.

▶ X.509 certificate for the NVSM REST server

Example path and filename: `/pki/node1.crt`

▶ Private key file corresponding to the above certificate

Example path and filename: `/pki/node1.key`

▶ The certificate of the CA who issued the above certificate

Example path and filename: `/pki/ca.crt`

An explanation of how to generate or obtain these certificates and keys is beyond the scope of this document since these have to be in compliance with the overall security architecture of the data center. In the most simplest form, users might use commands such as OpenSSL to generate their own certificate chain and keys. You may prefer to use free services such as https://letsencrypt.org/ to acquire them.

4.3. How to Configure NVSM Security

1. Edit the NVSM configuration file to use the paths and filenames of your certificate files and key file.

   Edit the `ca_cert`, `https_cert`, and `https_priv_key` configuration parameters to specify the path and filenames that NVSM shall use. The following use the example path and filenames.

   ```
   "ca_cert":"/pki/ca.crt",
   ```

   ```
   "https_cert":"/pki/node1.crt",
   ```

   ```
   "https_priv_key":"/pki/node1.key",
   ```

2. Restart the NVSM service.

   ```
   $ sudo systemctl restart nvsm
   ```

Chapter 5. NVSM Call Home

The NVIDIA System Manager (NVSM) Call Home, when enabled and with an internet connection, provides additional automation to NVSM health monitoring functionality. Instead of having to contact NVIDIA Enterprise Support to report critical alerts from NVSM, submit system logs, nvsm dump health files, and DGX serial numbers to create a support ticket, NVSM Call Home automates those tasks. This reduces overall turnaround time for resolving issues.

5.1. NVSM Call Home Overview

When NVSM raises a critical alert, NVSM Call Home performs the following actions:

► Proactively pushes **Critical** level alerts to NVIDIA Enterprise Services.

► Collects the system and nvsm dump, and system serial number, and uploads them to NVIDIA Enterprise Services..

► Creates a Support Case on the Enterprise Support portal.

NVSM Call Home also clears resolved alerts and pushes the updated status to NVIDIA Enterprise Services.

The figure below illustrates the end-to-end flow of the NVSM Call Home feature.
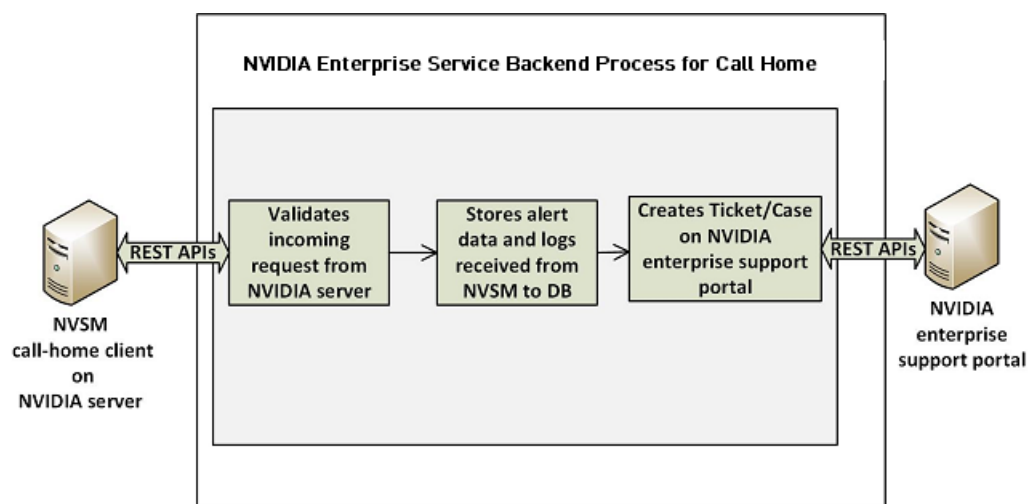
When NVSM Call Home is enabled on the DGX system and a critical alert is raised, the NVSM daemon on the DGX system initiates an HTTPS connection to the secured NVIDIA Enterprise Services backend and communicates the alert details and logs using the RESTful interface. The information is validated

and then a new Support Ticket is created on the NVIDIA Enterprise Support Portal. Communication of all alerts, including status changes for the alerts, is through REST calls.

NVSM Call Home operates in three different modes. It is not enabled by default, so to use NVSM Call Home you must enable one of the following modes:

5.1.1. Policy-enabled "automatic" Mode

► This mode batches alert submissions at regular intervals and then pushes them to the NVIDIA Enterprise Support portal.

► An internet connection is required.

► To enable, issue

```
$ sudo nvsm set /policy callhome_enable=true
```

See the section *Using NVSM Call Home in Automatic Mode* for details as well as configuration options for automatic mode.

5.1.2. Policy-enabled Offline Mode

► This mode is useful for air-gapped or highly-secured environments where access to the internet is limited.

► Instead of sending batched submissions to NVIDIA Enterprise Support, the alert and system information are stored on the local system. Users need to manually provide the gathered information to NVIDIA Enterprise Services to create a support case.

► To enable, issue

```
$ sudo nvsm set /policy offline_callhome_enable=true
```

See the section *Using NVSM Offline Call Home* for details as well as configuration options for offline mode.

5.1.3. On-demand Mode

► This mode gathers alert information and creates a submission on-the-fly to the Enterprise Support Portal.

► An internet connection is required.

► To initiate a Call Home submission on-demand, issue

```
$ sudo nvsm set /callhome trigger=true
```

See the section *Using NVSM On-Demand Mode* for details as well as configuration options for on-demand mode.

5.2. Using NVSM Call Home

NVSM Call Home can operate in two modes:

▶ **Automatic Mode** - NVSM Call Home operates automatically at regular intervals.

▶ **On-demand Mode** - NVSM Call Home sequence is initiated manually.

You can also set up NVSM Call Home to run offline; for example, on air-gapped systems.

5.2.1. Prerequisites for Using NVSM Call Home in Automatic or On-Demand Mode

5.2.1.1 Enabling Ports

Since NVSM Call Home communicates with the external NVIDIA server, port 443 must be enabled prior to operating NVSM Call Home.

5.2.1.2 Enabling Access

You need to register your system for NVSM Call Home so that the NVIDIA Services Cloud recognizes the system. Contact NVIDIA Enterprise Services to set up NVIDIA Call Home for your DGX system.

5.2.1.3 Validating NVSM Call Home Readiness

Before using NVSM Call Home, make sure the server is ready to support NVSM Call Home by performing a diagnostic test. The test does not create a ticket with NVIDIA Enterprise Services, but does test that the system is able to communicate with the NVIDIA Enterprise Services infrastructure.

To run the diagnostic, issue the following:

```
$ sudo nvsm set /callhome trigger=true diagtest=true
```

Note: This uses the on-demand mode of NVIDIA Call Home, explained in more detail in the section *Using NVSM On-demand Mode*.

To see the result of the last diagnostic test run, issue the following:

```
$ sudo nvsm show /callhome
```

Example output confirming the setup is ready for Call Home operation. Lines of interest are identified in bold.

```
/callhome
Properties:
    Trigger = False
    Op_Description = User initiated call home operation.
    Op_DiagTest = True
```

(continues on next page)

```
   Op_CaseId = none
   Op_State = Succeeded
   Op_StartTime = 2019-06-24T06:10:17Z
   Op_Message = Call Home operation Succeeded
   Op_Email =
```

If the output reports errors or failures, contact NVIDIA technical support for assistance.

5.2.2. Using NVSM Call Home in Automatic Mode

When automatic mode is enabled, NVSM monitors the server continuously and pushes critical or cleared alerts to NVESC and creates a support case on behalf of the registered user.

Automatic Mode Syntax

To enable automatic mode, issue the following.

```
$ sudo nvsm set /policy callhome_enable=true [callhome_email_contact=<email>]
↪[callhome_batch_interval=<time-in-seconds>]
```

Automatic Mode Configuration Options

You can configure NVSM Call Home using the following parameters:

▶ `callhome_email_contact`

An option to set an email-id. This should be a registered user of the NVIDIA Enterprise Support Portal. The email gets embedded in the case/ticket created in NVIDIA Enterprise Support Portal.

▶ `callhome_batch_interval`

Enabling automatic mode batches alert submissions at regular intervals and then pushes them to the NVIDIA Enterprise Support portal. Any raised alerts within that time frame will be sent (as individual Support Cases). By default, the interval is 600 seconds (10 minutes), but you can use this option to specify other intervals (in seconds).

Automatic Mode Example

The following example illustrates how to use these parameters.

```
$ sudo nvsm set /policy callhome_enable=true callhome_email_contact=123@example.com
↪callhome_batch_interval=610
```

Verifying Automatic Mode Status

To verify the status of the current setup, issue the following.

```
$ sudo nvsm show /policy
```

Example output:

```
/policy
Properties:
   callhome_batch_interval = 610
   callhome_email_contact = 123@example.com
   callhome_enable = True
   email_recipients =
```

```
email_sender =
email_smtp_server_name =
email_smtp_server_port = 0
```

`callhome_enable = True` indicates that Call Home automatic mode is enabled.

5.2.3. Using NVSM On-Demand Mode

NVSM Call Home On-Demand mode is a user-triggered call-home action. Triggering Call Home on-demand creates a Support Case with NVIDIA Enterprise Support Portal that includes a captured system dump ('nvsm dump health'). NVSM Call Home On-Demand can be used whether or not automatic mode is enabled.

On-Demand Mode Syntax

To trigger an NVSM Call Home sequence on-demand, issue the following.

```
# sudo nvsm set /callhome trigger=true [description="<description>"] [email=<email>
```

To cancel an on-demand Call Home in progress, issue the following.

```
# sudo nvsm set /callhome trigger=false
```

See the next section for an explanation of the optional parameters.

On-Demand Mode Configuration Options

You can configure NVSM Call Home triggered on-demand using the following parameters:

▶ `email`

This option sets an email-id. The email gets embedded in the case/ticket created in NVIDIA Enterprise Support Portal.

▶ `description`

This option lets you describe the purpose or the details for triggering On-Demand Call Home.

Examples of descriptive strings:

`"Testing"`

`"System running low in performance, takes several minutes to peform an nvidia-smi command."`

On-Demand Example

The following example illustrates how to use these optional parameters.

```
# sudo nvsm set /callhome trigger=true description="testing" email=123@example.com
```

Verifying On-Demand Status

To check the status of a Call Home sequence initiated on-demand, issue the following.

```
# sudo nvsm show /callhome
```

The following example output shows the progress of the Call Home sequence.

```
/callhome
Properties:
   Trigger = True
   Op_Description = testing
   Op_CaseId = none
   Op_State = Running
   Op_StartTime = 2019-06-12T08:28:45Z
   Op_Message = Collecting logs
   Op_Email = 123@example.com
```

The following example output shows that a case ID was created in the NVIDIA Enterprise Support portal.

```
/callhome
Properties:
   Trigger = False
   Op_Description = testing
   Op_CaseId = 0001XXX
   Op_State = Succeeded
   Op_StartTime = 2019-06-12T08:28:45Z
   Op_Message = Call Home operation Succeeded
   Op_Email = 123@example.com
```

`Trigger = False` indicates that the on-demand sequence is not running - in this case because it has completed.

5.2.4. Using NVSM Offline Call Home

To support DGX systems installed in air-gapped or highly-secured environments where access to the internet is limited, NVSM Call Home can be operated in offline mode (Offline Call Home). Like standard Call Home, Offline Call Home software proactively monitors the health of the DGX system and automatically

▶ Collects system dump and logs, and

▶ Collects alerts and system information.

However, instead of sending the information to NVIDIA Enterprise Services, NVSM Offline Call Home stores the information in a user-specified directory on the DGX system. Also, unlike standard Call Home, Offline Call Home operates in automatic mode only; there is no on-demand mode in Offline Call Home.

Prerequisites

Offline Call Home and standard Call Home cannot be enabled at the same time. To ensure that standard automatic-mode Call Home is not enabled, issue the following before enabling Offline Call Home.

```
$ sudo nvsm set /policy callhome_enable=false
```

Enabling Offline Call Home

Like standard Call Home, use the `nvsm set /policy` command to enable Offline Call Home.

```
$ sudo nvsm set /policy offline_callhome_enable=true \
offline_callhome_dump_destination_location=<path/to/location> \
offline_callhome_batch_interval=<batch-interval> \
offline_callhome_no_of_dumps_allowed=<number>
```

Offline Call Home Configuration Options

▶ `offline_callhome_dump_destination_location`

By default, Offline Call Home stores the system logs at `/var/log/nvsm_offline_callhome`. You can set a different location using this option.

▶ `offline_callhome_batch_interval`

Enabling Offline Call Home creates a batch of alerts at regular intervals and then pushes them to local storage. By default, the interval is 600 seconds (10 minutes), but you can use this option to specify other intervals (in seconds).

▶ `offline_callhome_no_of_dumps_allowed`

By default, NVSM Offline Call Home will store 9999999 different log files, but you can specify a smaller number for which to allocate space as needed.

Example of Enabling Offline Call Home

The following example illustrates how to use these parameters.

```
$ sudo nvsm set /policy \
offlinecallhome_enable=true \
offline_callhome_dump_destination_location=/tmp/offline_callhome_dump \
callhome_batch_interval=610 \
offline_callhome_no_of_dumps_allowed=10
```

Verifying the Offline Call Home Configurationn

To verify the status of the current setup, issue the following.

```
$ sudo nvsm show /policy
```

Example output showing the offline Call Home policy details.

```
/policy
Properties:
    offline_callhome_batch_interval = 610
    offline_callhome_enable = True
    offline_callhome_dump_destination_location = /tmp/offline_callhome_dump
    offline_callhome_no_of_dumps_allowed = 10
```

Verifying Contents of the Dump File

The contents of each batch is stored in a tar file.

▶ Tar file naming format:

`offlinecallhome-nvsm-health_<timestamp>_<serial-number>.tar.xz`

▶ The tar file contents -

▶ System dump

▶ JSON metadata file that lists the system and critical alerts.

JSON file naming format:

`offlinecallhome_notifications_<timestamp>_<hostname>_<serial-number>.json`

▶ JSON file format showing type of data included :

```
{
    "system_serial": "<serial number>",
    "system_name": "<hostname>",
    "notifications": [
        {
            "alert_id": "",
            "clear_time": "-",
            "component_id": "",
            "description": "",
            "event_time": "",
            "message": "",
            "message_details": ".",
            "recommended_action": "",
            "severity": "",
            "system_name": "",
            "system_serial": "",
            "type": ""
        }
    ]
}
```

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6.1. mattn/go-sqlite3

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