



Table of Contents

Chapter 1. Introduction.....	1
1.1. Verifying NVSM API Services.....	2
1.2. Configurable "Always On" Features.....	3
1.2.1. Health Monitor Alerts.....	3
1.2.2. Health Monitor Alert List.....	3
1.2.3. Health Monitor Policies.....	11
1.3. Verifying the Installation.....	11
1.3.1. Verifying "Always On" Services.....	11
1.3.2. Verifying NVSM Services.....	12
Chapter 2. Using the NVSM CLI.....	13
2.1. Using the NVSM CLI Interactively.....	13
2.2. Using the NVSM CLI Non-Interactively.....	14
2.3. Getting Help.....	14
2.3.1. nvsm "man" Page.....	15
2.3.2. nvsm --help/-h Flag.....	15
2.3.3. Help for NVSM CLI Commands.....	16
2.4. Setting DGX H100 BMC Redfish Password.....	19
2.5. Examining System Health.....	20
2.5.1. List of Basic Commands.....	20
2.5.2. Show Health.....	22
2.5.3. Dump Health.....	22
2.5.4. Show Versions.....	23
2.5.5. Show Storage.....	24
2.5.5.1. Show Storage Alerts.....	24
2.5.5.2. Show Storage Drives.....	26
2.5.5.3. Show Storage Volumes.....	27
2.5.6. Show GPUs.....	27
2.5.6.1. Showing Individual GPUs.....	28
2.5.6.2. Identifying GPU Health Incidents.....	29
2.5.7. Show Processors.....	30
2.5.7.1. Show Processor Alerts.....	31
2.5.8. Show Memory.....	32
2.5.8.1. Show Memory Alerts.....	33
2.5.9. Show Fans and Temperature.....	34
2.5.9.1. Show Thermal Alerts.....	34

2.5.9.2. Show Fans.....	35
2.5.9.3. Show Temperatures.....	36
2.5.10. Show Power Supplies.....	37
2.5.10.1. Show Power Alerts.....	37
2.5.11. Show Network Adapters.....	39
2.6. System Monitoring Configuration.....	40
2.6.1. Configuring Email Alerts.....	40
2.6.2. Generating a Test Alert for Email.....	41
2.6.3. Understanding System Monitoring Policies.....	42
2.6.3.1. Global Monitoring Policy.....	43
2.6.3.2. Memory Monitoring Policy.....	44
2.6.3.3. Processor Monitoring Policy.....	44
2.6.3.4. Storage Monitoring Policy.....	45
2.6.3.5. Thermal Monitoring Policy.....	47
2.6.3.6. Power Monitoring Policy.....	48
2.6.3.7. PCIe Monitoring Policy.....	49
2.6.3.8. GPU Monitoring Policy.....	49
2.6.3.9. Network Adapter Monitoring Policies.....	50
2.7. Performing System Management Tasks.....	52
2.7.1. Rebuilding a RAID/ESP Array for Current NVSM.....	52
2.7.2. Rebuilding a RAID 1 Array for Legacy NVSM (< 21.09).....	55
2.7.3. Setting MaxQ/MaxP on DGX-2 Systems.....	57
2.7.4. Performing a Stress Test.....	58
Chapter 3. Configuring NVSM Security.....	60
3.1. Overview of NVSM Security.....	60
3.2. What You Need to Configure NVSM Security.....	60
3.3. How to Configure NVSM Security.....	61
Chapter 4. Calling NVSM APIs.....	62
4.1. Getting Authorization to Call NVSM APIs.....	62
4.2. Calling NVSM APIs Using cURL, Python, or a Browser.....	63
Chapter 5. NVSM Call Home.....	66
5.1. NVSM Call Home Overview.....	66
5.2. Using NVSM Call Home.....	68
5.2.1. Prerequisites for Using NVSM Call Home in Automatic or On-Demand Mode..	68
5.2.1.1. Enabling Ports.....	68
5.2.1.2. Enabling Access.....	68
5.2.1.3. Validating NVSM Call Home Readiness.....	68
5.2.2. Using NVSM Call Home in Automatic Mode.....	69

5.2.3. Using NVSM On-Demand Mode.....	70
5.2.4. Using NVSM Offline Call Home.....	71
Appendix A. Third-Party Licenses.....	74

Chapter 1. Introduction

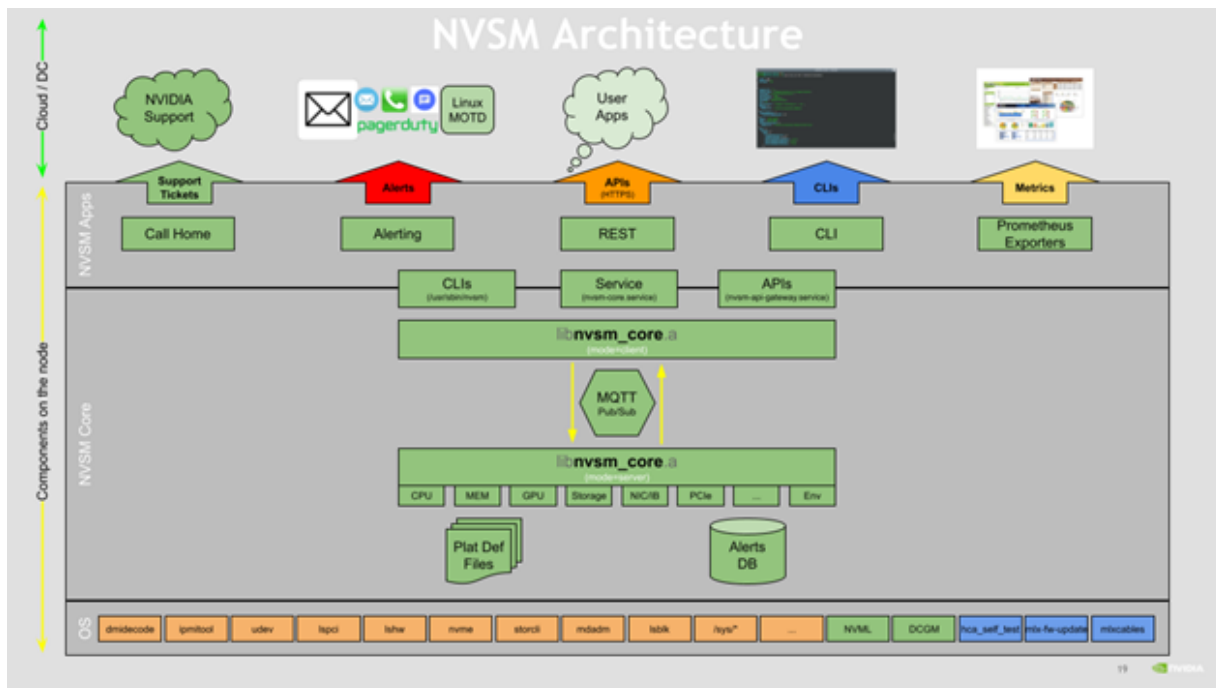
NVIDIA® System Management (NVSM) is an NVIDIA software stack for managing and monitoring NVIDIA-designed servers such as NVIDIA DGX™, CGX, and RTX servers.

- ▶ NVSM is an "always-on" health monitoring engine which catches issues proactively as opposed to other tools which need to be run post facto. By virtue of having deep knowledge of the underlying platform, NVSM has the optimal list of health checks to make as well as how frequently each check needs to happen.
- ▶ NVSM CLIs and APIs alleviate the need for users to
 - ▶ Have deep knowledge of tools such as ipmitool, dmidecode, lspci, storcli, mdadm, and lsblk.
 - ▶ Have deep knowledge of platform details such as the intended PCIe hierarchy, storage hierarchy, or error thresholds.
 - ▶ Manually correlate information from several tools; in many cases, the output of one tool needs to be manually parsed to know how to use the next tool. For example, BDF in SEL record vs BDF in lspci just to determine which device is faulty.
- ▶ NVSM catches issues which some customers might never notice. For example, some PCIe links might be running at lower link width/speed causing jobs to run slow. Without NVSM, customers might suspect something wrong with their jobs OR worse assume that DGX is simply that slow.
- ▶ NVSM provides
 - ▶ An on-demand health check suite which runs a battery of tests and reports deviations from expected results.
 - ▶ The ability to create a bundle of all relevant system logs required by NVIDIA support when reporting an issue.
 - ▶ A secure REST API interface removing the need for users/scripts to log-into the system. So it is easy to develop remote management SW applications using these APIs.
 - ▶ A Prometheus metrics exporter which can be enabled so an external Prometheus server can pull critical system metrics from the target DGX nodes.
- ▶ NVSM's call-home feature, if enabled, creates a support ticket on behalf of the customer automatically in case of platform issues, even before the customer notices it.
- ▶ In addition, NVSM provides other notification mechanisms like email and PagerDuty.

Currently, NVSM supports the following DGX systems:

- ▶ DGX servers: Complete NVSM functionality described in this document.
- ▶ DGX Station: Functionality is limited to using the CLI to check the health of the system and obtain diagnostic information.

The following is a high level diagram of the NVSM architecture.



Note: "Always on" 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.service
```

```
nvsm-core.service
```

```
nvsm-mqtt.service
```

```
nvsm-notifier.service
```

```
nvsm.service
```

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 "Always On" Features

NVSM 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. Health Monitor Alert List

The following table describes each alert ID.

Message and details	Alert ID	Component ID	Severity	Recommended Action
Unsupported drive configuration. Affected component URI: <code>{{ index.Params "Uri" }}</code>	NV-DRIVE-01	Drive Slot <>	Warning	See Recommended Action A below.
System entered degraded mode, drive in <code>{{ index.Params "DriveSlot" }}</code> is not supported.	NV-DRIVE-07	Drive Slot <>	Warning	See Recommended Action A below.
Unsupported SED drive configuration.	NV-DRIVE-09	Volume label	Warning	See Recommended Action A below.
Unsupported volume encryption configuration.	NV-DRIVE-10	Volume label	Critical	See Recommended Action A below.

Message and details	Alert ID	Component ID	Severity	Recommended Action
M.2 drive firmware version mismatch.	NV-DRIVE-11	Drive Slot <>	Warning	See Recommended Action A below.
System entered degraded mode, volume {{ index .Params \"ComponentName\" }} is under rebuild.	NV-VOL-01	Volume name	Warning	See Recommended Action A below.
System entered degraded mode, volume {{ index .Params \"ComponentName\" }} rebuild failed.	NV-VOL-02	Volume name	Critical	See Recommended Action A below.
System entered degraded mode, volume {{ index .Params \"ComponentName\" }} is in a degraded state.	NV-VOL-03	Volume name	Critical	See Recommended Action A below.
System entered degraded mode, volume {{ index .Params \"ComponentName\" }} is inactive or in a failed state.	NV-VOL-04	Volume name	Critical	See Recommended Action A below.
Raid-0 Volume {{ index .Params \"ComponentName\" }} is misconfigured.	NV-VOL-05	Volume name	Warning	See Recommended Action A below.
Raid-0 data volume for caching is not present.	NV-VOL-06		Informational	See Recommended Action A below.
EFI partition missing on boot volume. Run 'blkid' to check the partition type.	NV-VOL-09	Volume name	Critical	See Recommended Action A below.
Storage Volume {{ index .Params \"ComponentName\" }} utilization is nearing 90% of {{ index .Params \"Capacity\" }} bytes.	NV-VOL-10	Volume name	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.	NV-PSU-02	<PSU#> where # is the PSU number.	Warning	See Recommended Action A below.

Message and details	Alert ID	Component ID	Severity	Recommended Action
(Operating temperature exceeds the thermal specifications of the component.)				
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.
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.	NV-FAN-01	<FAN#_F> or <FAN#_R> where # is the fan module number.	Critical	See Recommended Action A below.

Message and details	Alert ID	Component ID	Severity	Recommended Action
(Fan speed reading has fallen below the expected speed setting.)		F is for front fan. R is for rear fan.		
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.
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.

Message and details	Alert ID	Component ID	Severity	Recommended Action
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.
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.	NV-PCI-02		Warning	See Recommended Action A below.

Message and details	Alert ID	Component ID	Severity	Recommended Action
(Link width degradation observed between {BDF1, BDF2},, expected link width is {} actual link width is {})				
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, controller {{ index .Params \"ComponentName\" }} is reporting an error.	NV-CONTROLLER-01	Controller name	Warning	See Recommended Action A below.
System entered degraded mode, Storage controller {{ index .Params \"ComponentName\" }} is reporting a PHY error.	NV-CONTROLLER-02	Controller name	Warning	See Recommended Action A below.
System entered degraded mode, controller {{ index .Params \"ComponentName\" }} is	NV-CONTROLLER-03	Controller name	Warning	See Recommended Action A below.

Message and details	Alert ID	Component ID	Severity	Recommended Action
set at lower than expected speed.				
System entered degraded mode, controller {{ index.Params \ComponentName\ }} is reporting an error.	NV-CONTROLLER-04	Controller name	Warning	See Recommended Action A below.
System entered degraded mode, controller {{ index.Params \ComponentName\ }} is reporting an error.	NV-CONTROLLER-05	Controller name	Critical	See Recommended Action A below.
System entered degraded mode, controller {{ index.Params \ComponentName\ }} is reporting an error.	NV-CONTROLLER-06	Controller name	Critical	See Recommended Action A below.
LEDStatus for controller {{ index.Params \ComponentName\ }} needs to be cleared.	NV-CONTROLLER-07	Controller name	Critical	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 {}.	NV-ETH-01		Critical	See Recommended Action B below.

Message and details	Alert ID	Component ID	Severity	Recommended Action
{ } Ethernet health check failing with Online NVRAM test failure.)				
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.
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.

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 "Always On" Services

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

```
$ sudo systemctl status nvsm-plugin-monitor-environment
nvsm-plugin-monitor-environment.service - Environmental DSHM service.
  Loaded: loaded (/user/lib/systemd/system/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-api-gateway.service
```

```
nvsm-core.service
```

```
nvsm-mqtt.service
```

```
nvsm-notifier.service
```

```
nvsm.service
```

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

```
$ sudo systemctl status nvsm-core
```

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

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

Chapter 2. 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.

2.1. 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:~$
```

2.2. 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.

2.3. 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.

2.3.1. 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
```

2.3.2. nvsm --help/-h Flag

By passing the --help or -h flag, the nvsm command will display a help message that is similar to "man nvsm". The help message can also be invoked through "nvsm --help". It shows a description, nvsm command verbs, options and a few examples

Example output:

```
user@dgxa100:~$ sudo nvsm --help
Run 'sudo nvsm [command] -h' for a command-specific help message
NVSM(1) NVSM CLI
NVSM(1)

NAME
  nvsm - NVSM CLI Documentation

  User Guide: https://docs.nvidia.com/datacenter/nvsm/latest/pdf/nvsm-user-guide.pdf

SYNOPSIS
  nvsm [help] [--color WHEN] [-i] [--log-level LEVEL] [--] [<command>]

DESCRIPTION
  nvsm(1), also known as NVSM CLI, is a command-line interface for System Management on NVIDIA DGX systems. Internally, NVSM CLI is a client of the NVSM (NVIDIA System Management) API server, which is facilitated by the nvsm(1) daemon.

  Invoking the nvsm(1) command without any arguments will start an NVSM CLI interactive session.
  Alternatively, by passing commands as part of the [<command>] argument, NVSM CLI can be run in a non-interactive mode.

  Note: nvsm must be run with root privileges.

NVSM COMMANDS
  nvsm show [-h, --help] [-level LEVEL] [-display CATEGORIES] [-all] [target] [where] :
    Display information about devices and other entities managed by NVSM

  nvsm cd [-h, --help] [target]:
    Change the working target address used by NVSM verbs

  nvsm set [-h, --help] [target] :
    Change the value of NVSM target properties

  nvsm start [-h, --help] [-noblock] [-force] [-quiet] [-timeout TIMEOUT] [target] :
    Start a job managed by NVSM

  nvsm dump health [-h, --help] [-o OUTPUT] [-t, -tags "tag1,tag2"] [-tfn, -tar_file_name "name.tar.xz"] :
    Generates a health report file

  nvsm stress-test [--usage, -h, --help] [-force] [-no-prompt] [<test>] [DURATION] :
    NVIDIA System Management Stress Testing
```

```

nvsm lock [-h, --help] [target] :
    Enable locking of SED

nvsm create [-h, --help] [target] :
    The create command is used to generate new resources on demand

OPTIONS
--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 LEVEL
    Set the output logging level. Possible values for LEVEL are "debug", "info",
    "warning",
    "error", and "critical". The default value is "warning".

EXAMPLES
sudo nvsm help
    Display the help message for NVSM CLI

sudo nvsm show -h
    Display the help message for the NVSM show command

sudo nvsm show gpus
    Display information for all GPUs in the system.

sudo nvsm
    Run nvsm in interactive mode

sudo nvsm show versions
    Display system version properties

sudo nvsm update firmware
    Run through the steps of selecting a firmware update container on the 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.

sudo nvsm dump health
    Produce a health report file suitable for attaching to support tickets.

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```

2.3.3. Help for NVSM CLI Commands

Each NVSM command verb within the NVSM CLI interactive session, such as `show`, `cd`, `set`, `start`, `dump health`, `stress-test`, `lock` and `create` recognizes a `-h` or `--help` flag that describes the NVSM command and its arguments. These commands also have their own man pages, which can be invoked, for example, using `man nvsm_show`.

The help messages show the description, NVSM command nouns (or sub commands), options and examples.

Example output:

```

user@dgxa100:~$ sudo nvsm show -h
NVSM_SHOW(1)          NVSM CLI          NVSM_SHOW(1)

NAME
  nvsm_show - NVSM SHOW CLI Documentation

SYNOPSIS
  nvsm show [-h, --help] [-level LEVEL] [-display CATEGORIES] [-all] [target]
  [where]

DESCRIPTION
  Show is used to display information about system components. It displays
  information
  about devices and other entities managed by NVSM

OPTIONS
  --help, -h
    show this help message and exit

  -level LEVEL, -l LEVEL
    Specify the target depth level to which the show command will traverse
  the
    target hierarchy.
    The default value for LEVEL is 1, which means "the current target only".

  -display CATEGORIES, -d CATEGORIES
    Select the categories of information displayed about the given target.
    Valid values for CATEGORIES are 'associations', 'targets', 'properties',
  'verbs',
    and 'all'. The default value for CATEGORY is 'all'. Multiple values can
  be
    specified by separating those values with colon. Sub-arguments for
  properties
    are supported which are separated by comma with paranthesis as optional.

  -all, -a
    Show data that are normally hidden. This includes OEM properties and OEM
  targets
    unique to NVSM.

  target
    The target address of the Managed Element to show. The target address can
  be relative
    to the current working target, or it can be absolute. Simple globbing to
  select multiple
    Managed Elements is also possible.

  where
    Using this argument, targets can be filtered based on the value of their
  properties.
    This can be used to quickly find targets with interesting properties.
  Currently this
    supports '==' and '!=' operations, which mean 'equal' and 'not equal'
  respectively.
    UNIX-style wildcards using '*' are also supported.

COMMANDS
  show alerts
    Display warnings and critical alerts for all subsystems

  show drives
    Display the storage drives

  show versions
    Display system version properties

  show fans
    Display information for all the fans in the system.

```

```
show firmware
    Walk through steps of selecting a firmware update container on the local
    DGX system,
    and run it to show the firmware versions installed on system. This
    requires that you
    have already loaded the container onto the DGX system.

update firmware
    Walk through steps of selecting a firmware update container on the local
    DGX system,
    and run it to update the firmware on system. This requires that you have
    already loaded
    the container onto the DGX system.

show gpus
    Display information for all GPUs in the system

show health
    Display overall system health

show memory
    Display information for all installed DIMMs

show networkadapters
    Display information for the physical network adapters

show networkdevicefunctions
    Display information for the PCIe functions for a given network adapter

show networkinterfaces
    Display information for each logical network adapter on the system.

show networkports
    Display information for the network ports of a given networkadapter

show nvswitches
    Display information for all the NVSwitch interconnects in the system.

show policy
    Display alert policies for subsystems

show power
    Display information for all power supply units (PSUs) in the system.

show processors
    Display information for all processors in the system.

show storage
    Display storage related information

show temperature
    Display temperature information for all sensors in the system

show volumes
    Show storage volumes

show powermode
    Display the current system power mode

show led
    Lists values for available system LED status. Includes u.2 NVME, Chassis/
    Blade LED
    status(on applicable platforms) disable exporters
    Disable NVSM metric collection data

show controllers
```

```
List applicable controllers properties. Applicable for SAS storage
controller in dgx1,
and M.2 and U.2 NVMe controller properties for other platforms.
```

EXAMPLES

```
sudo nvsm show -h
    Display the help message for the NVSM show command

sudo nvsm show health -h
    Display the help message for the NVSM show health command

sudo nvsm show gpus
    Display information for all GPUs in the system.

sudo nvsm show versions
    Display system version properties

sudo nvsm show storage
    View all storage-related information

sudo nvsm show processors
    Information for all CPUs installed on the system
```

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21.07.12-4-g5586f4ba Aug 04, 2021 NVSM_SHOW(1)

When a wrong command is entered, the CLI prompts the user to check the specified help message.

```
:~$ sudo nvsm show wrong_command
ERROR:nvsm:Target address "wrong_command" does not exist
Run: 'sudo nvsm show --help' for more options
```

2.4. Setting DGX H100 BMC Redfish Password

In DGX H100, Redfish services in BMC can be accessed using the BMC Redfish host IP address, which is termed the Host Interface. NVSM deployed on the Host OS communicates over Host Interface with the BMC Redfish services for the system data.

The Redfish host interface is a secured communication channel. As a prerequisite, BMC credentials with minimal read type access is set up in the Host OS before making any communication with the BMC Redfish services via NVSM.

The following NVSM commands sets up the BMC credentials for NVSM consumption in Host OS:

```
# nvsm set -bmccred (or) # nvsm set --bmccredentials

$ sudo nvsm set -bmccred
BMC credentials entered will be encrypted and stored.
Enter BMC username: admin
Enter BMC password:
Re Enter BMC password:
Entered credentials stored successfully.
```

Credentials get encrypted and stored on the Host.

2.5. 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.

2.5.1. 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
<code>\$ sudo nvsm show alerts</code>	Displays warnings and critical alerts for all subsystems
<code>\$ sudo nvsm show policy</code>	Displays alert policies for subsystems
<code>\$ sudo nvsm show versions</code>	Displays system version properties

Health Commands	Descriptions
<code>\$ sudo nvsm show health</code>	Displays overall system health
<code>\$ sudo nvsm dump health</code>	Generates a health report file

Storage Commands	Descriptions
<code>\$ sudo nvsm show storage</code>	Displays all storage-related information
<code>\$ sudo nvsm show drives</code>	Displays the storage drives
<code>\$ sudo nvsm show controllers</code>	Display the storage controllers
<code>\$ sudo nvsm show volumes</code>	Displays the storage volumes

GPU Commands	Descriptions
<code>\$ sudo nvsm show gpus</code>	Displays information 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.

2.5.2. 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.

2.5.3. 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
```

The option `-qkd` or `--quick_dump` can be used to collect the health report more quickly, at the cost of higher CPU/memory consumption.

```
# nvsm dump health -qkd
```

2.5.4. Show Versions

The “`nvsm show versions`” command displays hardware components on board, along with their firmware versions. It also shows the installed version of NVSM, Datacenter GPU Manager, and OS among others.

```
user@dgxa100:~$ sudo nvsm show versions
```

Example output:

```
initializing NVSM Core...

/versions
Properties:
  dgx-release = 5.1.0
  nvidia-driver = 470.57.01
  cuda-driver = 11.4
  os-release = Ubuntu 20.04.2 LTS (Focal Fossa)
  kernel = 5.4.0-77-generic
  nvidia-container-runtime-docker = 3.4.0-1
  docker-ce = 20.10.7
  platform = DGXA100
  nvsm = 21.07.12-5-g9775e940-dirty
  mlnx-ofed = MLNX_OFED_LINUX-5.4-1.0.3.0:
  datacenter-gpu-manager = 1:2.2.9
  datacenter-gpu-manager-fabricmanager = 470.57.01-1
  sBIOS = 1.03
  vBIOS-GPU-0 = 92.00.45.00.06
  vBIOS-GPU-1 = 92.00.45.00.06
  vBIOS-GPU-2 = 92.00.45.00.06
  vBIOS-GPU-3 = 92.00.45.00.06
  vBIOS-GPU-4 = 92.00.45.00.06
  vBIOS-GPU-5 = 92.00.45.00.06
  vBIOS-GPU-6 = 92.00.45.00.06
  vBIOS-GPU-7 = 92.00.45.00.06
  BMC = 0.14.17
  CEC-BMC-1 = 03.28
  CEC-Delta-2 = 04.00
  PSU-0 Chassis-1 = 01.05.01.05.01.05
  PSU-1 Chassis-1 = 01.05.01.05.01.05
  PSU-2 Chassis-1 = 01.05.01.05.01.05
  PSU-3 Chassis-1 = 01.05.01.05.01.05
  PSU-4 Chassis-1 = 01.05.01.05.01.05
  PSU-5 Chassis-1 = 01.07.01.05.01.06
  MB-FPGA = 0.01.03
  MID-FPGA = 0.01.03
  NvSwitch-0 = 92.10.18.00.02
  NvSwitch-1 = 92.10.18.00.02
  NvSwitch-2 = 92.10.18.00.02
  NvSwitch-3 = 92.10.18.00.02
  NvSwitch-4 = 92.10.18.00.02
  NvSwitch-5 = 92.10.18.00.02
  SSD-nvme0 (S/N S4YPNE0MB00495) System-1 = EPK9CB5Q
  SSD-nvme1 (S/N S436NA0M510827) System-1 = EDA7602Q
  SSD-nvme2 (S/N S436NA0M510817) System-1 = EDA7602Q
  SSD-nvme3 (S/N S4YPNE0MB01307) System-1 = EPK9CB5Q
  SSD-nvme4 (S/N S4YPNE0MC01447) System-1 = EPK9CB5Q
```

2.5.5. 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
```

The following NVSM commands also show storage-related information.

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

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

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

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

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
```

2.5.5.1. 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-07	Warning	System has unsupported drive
NV-DRIVE-09	Warning	Unsupported SED drive configuration
NV-DRIVE-10	Critical	Unsupported volume encryption configuration
NV-DRIVE-11	Warning	M.2 firmware version mismatch
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
NV-CONTROLLER-01	Warning	Controller is reporting an error
NV-CONTROLLER-02	Warning	Storage controller is reporting PHY error
NV-CONTROLLER-03	Warning	Controller set at lower than expected speed

Alert ID	Severity	Details
NV-CONTROLLER-04	Critical	Controller is reporting an error
NV-CONTROLLER-05	Critical	Controller is reporting an error
NV-CONTROLLER-06	Critical	Controller is reporting an error
NV-CONTROLLER-07	Critical	LEDStatus for controller needs to be cleared

2.5.5.2. 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

```

2.5.5.3. 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
properties:
  Status_State = Enabled
  Status_Health = OK
  Name = md0
  Encrypted = False
  VolumeType = RAID-1
  Drives = [ nvme0n1, nvme1n1 ]
  CapacityBytes = 893.6G
  Id = md0
Verbs:
  cd
  show

```

2.5.6. 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

```

2.5.6.1. 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

```

2.5.6.2. 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

```

- 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.

2.5.7. 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

```

2.5.7.1. 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://
nvidia.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.

2.5.8. 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@expl-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

```

2.5.8.1. 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.

2.5.9. 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
```

2.5.9.1. 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://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.

2.5.9.2. 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

```

2.5.9.3. 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

```

2.5.10. 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

```

2.5.10.1. 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

2.5.11. 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
```

Display a List of Muted Adapters

To display a list of the muted adapters, run the following command:

```
$ sudo nvsm show /chassis/localhost/NetworkAdapters/policy
/chassis/localhost/NetworkAdapters/policy
Properties:
mute_monitoring = <NOT_SET>
mute_notification = <NOT_SET>
```

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
```

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 adapter device 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
```

Display a List of Interfaces

Run the following command:

```
$ sudo nvsm show /chassis/localhost/NetworkAdapters
/chassis/localhost/NetworkAdapters
Targets:
PCI0000_0c_00
PCI0000_12_00
PCI0000_4b_00
PCI0000_54_00
PCI0000_8d_00
PCI0000_94_00
PCI0000_ba_00
PCI0000_cc_00
PCI0000_e1_00
PCI0000_e2_00
```

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
```

In 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
```

Add an Interface to the Mute Notifications

Here is an example of a command you can run to add an interface to the mute notifications:

```
$ sudo nvsm set chassis/localhost/NetworkAdapters/policy
mute_notification=PCI0000_0c_00,PCI0000_12_00
```

2.6. 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.

2.6.1. 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
```

2.6.2. Generating a Test Alert for Email

From within an NVSM CLI interactive session, a user may generate a test alert in order to trigger an SMTP instance and receive an email notification.

Creating a Test Alert

NVSM CLI provides a "create testalert" command to generate a dummy alert that will trigger any SMTP or Call Home defined notification. Within an NVSM CLI interactive session, this basic command generates a dummy alert with default component_id = Test0 and severity = Warning.

```
~$ sudo nvsm create testalert
```

To configure the Severity and Component of a test alert, issue the following:

```
~$ sudo nvsm create testalert <component_id> <severity>
```

Example of generating a dummy alert with component_id = Email1 and severity = Critical:

```
~$ sudo nvsm create testalert Email1 Critical
```

Clearing a Test Alert

NVSM CLI also provides a "clear testalert" command to dismiss a generated dummy alert. Within an NVSM CLI interactive session, this basic command will clear any test alert with `component_id=Test0`, even if there are multiple such alerts.

```
~$ sudo nvsm clear testalert
```

To specify which test alert to dismiss, issue the following:

```
~$ sudo nvsm clear testalert <component_id>
```

Showing a Test Alert

To display all generated test alerts, the NVSM CLI provides a "show testalerts" command

```
~$ sudo nvsm show testalerts
```

Example output:

```
/systems/localhost/testalerts/alert0
Properties:
  system_name = system-name5
  message_details = Dummy Test
  component_id = Test0
  description = No component is reporting an error. This is a test.
  event_time = 2021-08-04T15:55:46.926710484-07:00
  recommended_action = Please run 'sudo nvsm clear testalert' to dismiss this
  alert.
  alert_id = NV-TEST-01
  system_serial = To be filled by O.E.M.
  message = Test Alert.
  severity = Warning
  clear_time = -
  hidden = false
  type = TestAlerts
```

2.6.3. 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	

CLI Target	Description
/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/NetworkAdapters/policy	NVSM policy for monitoring the physical network adapters
/chassis/localhost/NetworkAdapters/<ETHx>/NetworkPorts/policy	NVSM policy for monitoring the network ports for the specified Ethernet network adapter
/chassis/localhost/NetworkAdapters/<IBy>/NetworkPorts/policy	NVSM policy for monitoring the network ports for the specified InfiniBand network adapter
/chassis/localhost/NetworkAdapters/<ETHx>/NetworkDeviceFunctions/policy	NVSM policy for monitoring the PCIe functions for the specified Ethernet network adapter
/chassis/localhost/NetworkAdapters/<IBy>/NetworkDeviceFunctions/policy	NVSM policy for monitoring the PCIe functions for the specified InfiniBand network adapter

2.6.3.1. 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 relaying email [smtp.domain.com]
email_smtp_server_port	Port Number used by the SMTP server for providing SMTP relay service. Numeric value

2.6.3.2. 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 = <NOT_SET>
  mute_monitoring = <NOT_SET>

Verbs:
  cd
  set
  show
```

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

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

2.6.3.3. 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 = <NOT_SET>
  mute_monitoring = <NOT_SET>

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.

2.6.3.4. 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 = <NOT_SET>
  volume_poll_interval = 10
  drive_mute_monitoring = <NOT_SET>
  drive_mute_notification = <NOT_SET>
  drive_poll_interval = 10
  volume_mute_notification = <NOT_SET>
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

Property	Syntax	Description
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.

Storage volumes are identified by NVSM uniquely by their associated UUID. The mute monitoring for volume resources will hence use UUID instead of volume name. This is required for NVSM versions greater than 21.09.

Steps to identify the UUID of a volume to be set in mute monitoring & notification are listed below.

1. To get the list of volumes in the server run the below command:

```
# nvsm show volumes
# nvsm show volumes
/systems/localhost/storage/volumes/md0
Properties:
  CapacityBytes = 1918641373184
  Encrypted = False
  Id = md0
  Name = md0
  Status_Health = OK
  Status_State = Enabled
  VolumeType = Mirrored
```

2. To find the UUID of a particular volume, run the below command. The command lists properties which contain the UUID for the volume with the name md0:

```
# mdadm --detail /dev/{volume name}
# mdadm --detail /dev/md0
/dev/md0:
  Version : 1.2
  Creation Time : Tue Feb 23 18:04:37 2021
  Raid Level : raid1
  Array Size : 1873673216 (1786.87 GiB 1918.64 GB)
  Used Dev Size : 1873673216 (1786.87 GiB 1918.64 GB)
  Raid Devices : 2
  Total Devices : 2
  Persistence : Superblock is persistent

  Intent Bitmap : Internal

  Update Time : Tue Apr 11 08:13:48 2023
  State : active
  Active Devices : 2
  Working Devices : 2
  Failed Devices : 0
  Spare Devices : 0

Consistency Policy : bitmap
```

```

      Name : dgx-20-04:0
      UUID : 3568aa82:dc3da8ac:5c17ea13:b04cf894
      Events : 78460

      Number   Major   Minor   RaidDevice  State
      0         259     5       0           active sync /dev/nvme2n1p2
      1         259    15       1           active sync /dev/nvme3n1p2

```

3. Run the below command to set the UUID for mute monitoring:

```

# nvsm set /systems/localhost/storage/policy volume_mute_monitoring=<UUID>

# nvsm set /systems/localhost/storage/policy
volume_mute_monitoring=3568aa82:dc3da8ac:5c17ea13:b04cf894

```



Note: If you get an error message that states: WARNING:nvsm:Unknown volume ID: 3568aa82:dc3da8ac:5c17ea13:b04cf894, it can be ignored. This is a known issue that will be fixed in a future version of NVSM.

4. Run the below command to set the UUID for mute notification:

```

# nvsm set /systems/localhost/storage/policy volume_mute_notification=<UUID>

# nvsm set /systems/localhost/storage/policy
volume_mute_notification=3568aa82:dc3da8ac:5c17ea13:b04cf894

```

5. Run the below command to verify that the policies were correctly set:

```

# nvsm show /systems/localhost/storage/policy

# nvsm show /systems/localhost/storage/policy
/systems/localhost/storage/policy
Properties:
  controller_mute_monitoring = <NOT_SET>
  controller_mute_notification = <NOT_SET>
  controller_poll_interval = 60
  drive_mute_monitoring = <NOT_SET>
  drive_mute_notification = <NOT_SET>
  drive_poll_interval = 60
  volume_mute_monitoring = 3568aa82:dc3da8ac:5c17ea13:b04cf894
  volume_mute_notification = 3568aa82:dc3da8ac:5c17ea13:b04cf894
  volume_poll_interval = 60
Targets:
Verbs:
  cd
  set
  show

```

2.6.3.5. 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 = <NOT_SET>
  pdb_mute_monitoring = <NOT_SET>
  fan_mute_monitoring = <NOT_SET>
  pdb_mute_notification = <NOT_SET>
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.

2.6.3.6. 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 = <NOT_SET>
  mute_monitoring = <NOT_SET>

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.

2.6.3.7. 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 = <NOT_SET>
  mute_monitoring = <NOT_SET>

Verbs:
  cd
  set
  show
```

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

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

2.6.3.8. 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 = <NOT_SET>
  mute_monitoring = <NOT_SET>

Verbs:
  cd
  set
  show
```

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

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

2.6.3.9. Network Adapter Monitoring Policies

Network Adapter Policy

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

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

Example output:

```
/chassis/localhost/NetworkAdapters/policy
Properties:
  mute_notification = <NOT_SET>
  mute_monitoring = <NOT_SET>
Verbs:
  cd
  set
  show
```

The properties are described in the following table.

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

The mute monitoring is assigned by using the Physical Adapter name and not the logical name. To get the physical adapter name use the command:

```
$ sudo nvsm show /chassis/localhost/NetworkAdapters
```

This command will display a list of target adapter names as shown below:

```
:~$:/etc/nvsm/platforms# sudo nvsm show /chassis/localhost/NetworkAdapters
/chassis/localhost/NetworkAdapters
Targets:
PCI0000_0c_00
PCI0000_12_00
PCI0000_4b_00
PCI0000_54_00
PCI0000_8d_00
PCI0000_94_00
PCI0000_ba_00
PCI0000_cc_00
PCI0000_e1_00
PCI0000_e2_00
```



Note: Use these adapter names to assign monitoring policies.

Here is an example that uses the `PCI0000_0c_00` network interface:

```
:~$ sudo nvsm show /chassis/localhost/NetworkAdapters/PCI0000_0c_00/NetworkPorts/policy
```

Example output:

```
/chassis/localhost/NetworkAdapters/PCI0000_0c_00/NetworkPorts/policy
Properties:
  mute_notification = <NOT_SET>
  mute_monitoring = <NOT_SET>
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.

Network Devices Functions Policy

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

The following command uses the `PCI0000_0c_00` network port to demonstrate this command.

```
~$ sudo nvsm show /chassis/localhost/NetworkAdapters/PCI0000_0c_00/NetworkDeviceFunctions/policy
```

Example output:

```
/chassis/localhost/NetworkAdapters/PCI0000_0c_00/NetworkDeviceFunctions/policy
Properties:
  mute_monitoring = <NOT_SET>
  mute_notification = <NOT_SET>
  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.

Property	Syntax	Description
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	

2.7. Performing System Management Tasks

This section describes commands for accomplishing some system management tasks.

2.7.1. Rebuilding a RAID/ESP Array for Current NVSM

On DGX systems, cache drives are configured as a RAID 0 array by default. This volume is mounted to `/raid`. In the example below, it shows as `/dev/md1`, but the name can be different depending on the OS naming schema and configuration.

Additionally for DGX systems with two NVMe OS drives, echo OS drive have two partitions:

- ▶ The second partitions are configured as a RAID 1 array with the operating system installed. In the examples below, it shows as `/dev/md0`.
- ▶ The first partition is known as the EFI System Partition (ESP). NVSM monitors the content of this partition from both drives. If one of the ESP is corrupted, NVSM can be used to recover that partition from the healthy ESP.



Note: This is not a RAID array, because UEFI does not support booting from software raid volumes.

Viewing a Healthy RAID/ESP Volume

On a healthy system, the OS volume appears with `VolumeType = Mirrored` and `Status_Health = OK`. For example:

```
nvsm(/systems/localhost/storage)-> show volumes/md0
/systems/localhost/storage/volumes/md0
Properties:
  CapacityBytes = 1918641373184
```



```

Encrypted = False
Id = md0
Name = md0
Status_Health = OK
Status_State = Enabled
VolumeType = Mirrored
Targets:
Verbs:
  cd
  show

```

The cache volume appears with `VolumeType = NonRedundant` and `Status_Health = OK`. For example:

```

nvsm-> cd /systems/localhost/storage
nvsm(/systems/localhost/storage)-> show volumes/md1

/systems/localhost/storage/volumes/md1
Properties:
  CapacityBytes = 30724962910208
  Encrypted = False
  Id = md1
  Name = md1
  Status_Health = OK
  Status_State = Enabled
  VolumeType = NonRedundant
Targets:
  encryption
Verbs:
  cd
  show

```

The ESP volume appears with `VolumeType = EFI system partition` and `Status_Health = OK`. The name of the ESP volume varies per system; you can use the command `nvsm show volumes` to list all volumes and look for `VolumeType = EFI system partition`. Here's the example from DGX A100:

```

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

...

/systems/localhost/storage/volumes/nvme2n1p1
Properties:
  CapacityBytes = 536870912
  Encrypted = False
  Id = nvme2n1p1
  Name = nvme2n1p1
  Status_Health = OK
  Status_State = Enabled
  VolumeType = EFI system partition
...

/systems/localhost/storage/volumes/nvme3n1p1
Properties:
  CapacityBytes = 536870912
  Encrypted = False
  Id = nvme3n1p1
  Name = nvme3n1p1
  Status_Health = OK
  Status_State = StandbyOffline
  VolumeType = EFI system partition

Targets:
Verbs:
  cd

```

```
show
```

Viewing a Degraded RAID/ESP Volume

On a system with degraded OS volume, the md0 volume will appear with only one drive, with the following `Status_Health = Critical` message:

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

/systems/localhost/storage/volumes/md0
Properties:
  CapacityBytes = 1918641373184
  Encrypted = False
  Id = md0
  Name = md0
  Status_Health = Critical
  Status_State = Enabled
  VolumeType = Mirrored
Targets:
Verbs:
  cd
  show
```

On a system with corrupted ESP, the volume will appear with the following `Status_Health = Critical` and `Status_State = UnavailableOffline` messages:

```
nvsm-> cd /systems/localhost/storage
nvsm(/systems/localhost/storage)-> show volumes/nvme2n1p1

/systems/localhost/storage/volumes/nvme2n1p1
Properties:
  CapacityBytes = 536870912
  Encrypted = False
  Id = nvme2n1p1
  Name = nvme2n1p1
  Status_Health = Critical
  Status_State = UnavailableOffline
  VolumeType = EFI system partition
Targets:
Verbs:
  cd
  show
```

Rebuilding the RAID/ESP Volume

To rebuild the RAID/ESP volume, make sure that you have replaced failed NVMe drives.

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 select which volumes to rebuild.

- ▶ raid-1 for OS volume
- ▶ raid-0 for cache volume
- ▶ esp for EFI system partition

For raid-1 volume, you also need to enter the replaced drive name.



Note: This is not the partition name. For example, use nvme3 instead of nvme3n1p2.

```
nvsm(/systems/localhost/storage)-> start volumes/rebuild

PROMPT: In order to rebuild volume, volume type is required. Please
specify the volume type to rebuild from options below.
raid-0: create raid-0 data volume
raid-1: rebuild OS boot and root volumes
esp:    find and replicate an empty EFI system partition

Type of volume rebuild (CTRL-C to cancel): raid-1

PROMPT: In order to rebuild this volume, a spare drive
is required. Please specify the spare drive to
use to rebuild RAID-1.

Name of spare drive for RAID-1 rebuild (CTRL-C to cancel): nvme3

WARNING: Once the rebuild process is started, the
process cannot be stopped.

Start RAID-1 rebuild? [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/rebuild started at 2023-04-10 Initiating
RAID-1 rebuild on volume md0...
0.0% [\ ]
```

4. After a few seconds, the "Rebuilding RAID-1 ..." message appears.

```
/systems/localhost/storage/volumes/rebuild started at 2023-04-10 08:22:58.910025
Rebuilding RAID-1...
31.0% [===== / ]
```

5. If this message remains at Initiating RAID-1 rebuild for more than 30 seconds, there is a problem with the rebuild process. Verify that 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 drive, see the [NVIDIA DGX-2 Service Manual](#) or [NVIDIA DGX A100 Service Manual](#).

2.7.2. Rebuilding a RAID 1 Array for Legacy NVSM (< 21.09)

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.

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
```

Viewing a Degraded RAID Volume

On a system with degraded OS volume, the md0 volume will appear with only one drive, with the following `Status_Health = Warning`, and `Status_State = Degraded` messages:

```
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.

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, there is a problem with the rebuild process. Verify that 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](#) or [NVIDIA DGX A100 Service Manual](#).

2.7.3. 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.

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.

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.

2.7.4. Performing a Stress Test

NVSM supports functionality to simultaneously stress various components (GPU, PCIe, DIMMs, Storage Drives, CPUs, Network Cards) of the system with large workloads.

The stress-test will provide a summary at the end determining whether each stressed component passed the test or failed with some error. NVSM will also monitor various system metrics during the stress-test to provide a clearer picture of the kinds of computational loads imposed. This stress test can be invoked from the CLI.

Syntax:

```
$ sudo nvsm stress-test [--usage] [--force] [--no-prompt] [<test>...] [DURATION]
```

For help on running the test, issue the following.

```
$ sudo nvsm stress-test --usage
```

Example output for `sudo nvsm stress-test 60 --force` :

```
swqa@ubuntu-luna2:~$ sudo nvsm stress-test 60 --force
```

```
Initializing NVSM Core...
```

```
##### NVSM STRESS #####
```

WARNING:

These stress tests are potentially disruptive and can interfere with other jobs you might be running. Make sure to be running as few jobs as possible before proceeding.
 (Pass `--no-prompt` option in command next time to suppress this prompt)
 If running GPU Stress Test, expect test to take longer than countdown duration.
 The NIC (network interface card) Stress Test is only available on DGX-1, DGX-2, and Luna Systems.
 If it is run on non-supported platforms, results for this component will be blank.

```
Are you sure you want to proceed [y/n]? y
```

```
Stressing GPU : Multiplying matrices on GPUs
Stressing CPU : Multiplying matrices on CPUs
Stressing Memory : Mapping pages into memory
Stressing Storage : Performing disk I/O operations
Stressing Network Cards : Performing loopback bandwidth stress
```

```
Fetching stream progress from backend...
```

```
100% Complete...
```

```
GPU          PASS
CPU          PASS
Memory       PASS
Storage      PASS
PCIe        PASS
NIC         SKIPPED
```

Component	PreTest	Min	Max	Avg	Unit
GPU_TEMP	32.5	32.5	32.5	32.5	C
CPU_TEMP	52.5	52.5	52.5	52.5	C
MEM_TEMP	32.75	32.75	32.75	32.75	C
POWERDRAW	4134	4134	4134	4134	W
FANSPEED	6289.55	6289.55	6289.55	6289.55	RPM
GPU_LOAD	0	0	100.00	50.00	%
CPU_LOAD	36.89	36.89	36.89	36.89	%
MEM_LOAD	0.43	0.43	0.43	0.43	%
DISK_LOAD	0.12	0.12	0.12	0.12	%

```
Stress Test Log:/var/nvsmlog/nvsm/StressTestLog2021-08-03T01:52:22-04:00.nvsmlog
```

Chapter 3. Configuring NVSM Security

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

3.1. 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.

3.2. 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 OpensSSL to generate their own certificate chain and keys. You may prefer to use free services such as <https://letsencrypt.org/> to acquire them.

3.3. 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 4. Calling NVSM APIs

This section explains how to call NVSM APIs from your application, from the command shell, or from a browser. For a detailed list of NVSM APIs, refer to the [NVSM API Reference](#).



Important: Using the IPv4/IPv6 Protocol: NVSM binds port 273 to 127.0.0.1 to limit external communications. To open other ports for IPV4 or IPV6, edit the `bindaddress` attribute in the file `nvsm.config` and then restart NVSM.

4.1. Getting Authorization to Call NVSM APIs

Since NVSM APIs can be used to get detailed information about the platform as well as to perform potentially disruptive operations on the system (for example, RAID rebuild, firmware update, etc.), they are secured such that only the root user can authorize the use of these APIs.

JSON Web Token (JWT): Calling NVSM APIs require [JWTs](#). NVSM provides a command to generate these tokens. The command requires root privileges to run. The resulting token must be passed in the HTTP request header as a [bearer authorization](#) token.

HTTPS: NVSM APIs are served over HTTPS instead of HTTP. HTTPS requires the API server to present the client with a certificate issued by a Certificate Authority (CA) that the client trusts. If you provisioned NVSM with genuine certificates as detailed in section [Configuring NVSM Security](#), you will need to copy the CA certificate file to the client machine which intends to call NVSM APIs. If you do not take that step, you will get certificate validation errors and will need to ignore them.

The following command can be used to obtain a JWT. This command uses SSH to reach the DGX node (where NVSM is running) and runs the command `nvsm_api_gateway` to generate a token with the specified validity.

Syntax

```
ssh -t <user>@<DGX Node IP> "sudo nvsm_api_gateway -gentoken <days of validity>"
```

Example

```
apicaller@mylaptop$ ssh -t dgxadmin@dc1_dgx2_node1 "sudo nvsm_api_gateway -gentoken 2"
dgxadmin@dc1_dgx2_node1's password:
[sudo] password for lab:
Token String :
  eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJhZG1pb2I6dHJ1ZSwiZXhwIjoxNTMzNjk1MTc0fQ.WANIX6_vMdfkvBVI
Connection to dc1_dgx2_node1 closed.
apicaller@mylaptop$
```

4.2. Calling NVSM APIs Using cURL, Python, or a Browser

Using cURL

Syntax

```
curl --cacert <CA-certificate-file> -X GET -H "Authorization: Bearer <jwt-token-string>" https://<dgx-node-ip>:273/<REST EndPoint>
```

Example

```
$ curl --cacert /pki/dc1_ca.crt -H "Authorization: Bearer
  eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJhZG1pb2I6dHJ1ZSwiZXhwIjoxNTMzNjk1MTc0fQ.vs-
  kms46o2D3vzGhgyfmd6c8VHfHLM7vcCknbsyC04" https://dc1_dgx2_node1:273/redfish/v1/
Systems | jq
 % Total      % Received % Xferd  Average Speed   Time    Time     Time  Current
                               Dload  Upload   Total   Spent    Left   Speed
100   304    100   304     0     0  13217      0  --:--:-- --:--:-- --:--:-- 13217
{
  "@odata.type": "#ComputerSystemCollection.ComputerSystemCollection",
  "Name": "Computer System Collection",
  "Members@odata.count": 1,
  "Members": [
    {
      "@odata.id": "/redfish/v1/Systems/1"
    }
  ],
  "@odata.context": "/redfish/v1/
$metadata#ComputerSystemCollection.ComputerSystemCollection",
  "@odata.id": "/redfish/v1/Systems"
}
$
```



Note:

- ▶ Replace `/pki/dc1_ca.crt` with the correct path on the client machine where the CA certificate file is copied.
- ▶ If you did not provision NVSM with genuine certificates, replace the option `'--cacert <CA certificate file>'` with `'-k'` to make cURL bypass certificate validation.

2. Add an HTTP request header.
 - a). In the ModeHeader extension example, open the extension and then click "+" and select Request Header.
 - b). In the Name Field, enter "Authorization" (without the quotes).
 - c). In the Value Field, enter "Bearer <JWT string>" (without quotes and replace *JWT string* with the actual token string).

Refer to <https://mod-header.appspot.com/> for more details if required.

3. Import the CA certificate into the browser.
 - a). For Chrome, navigate to Settings->Manage certificates (in the Advanced: Privacy and security section) to open the Certificates dialog.
 - b). Click Import, then follow the Certificate Import Wizard to import the CA certificate (for example `/pki/dc1_ca.crt`) into the browser.
4. In the browser address bar, enter the URI that corresponds to any NVSM API and then press Enter.

For example, enter `https://<dgx-node-ip>:273/redfish/v1/Systems` and then press Enter to get information about the DGX system.

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, nvsmdump 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.

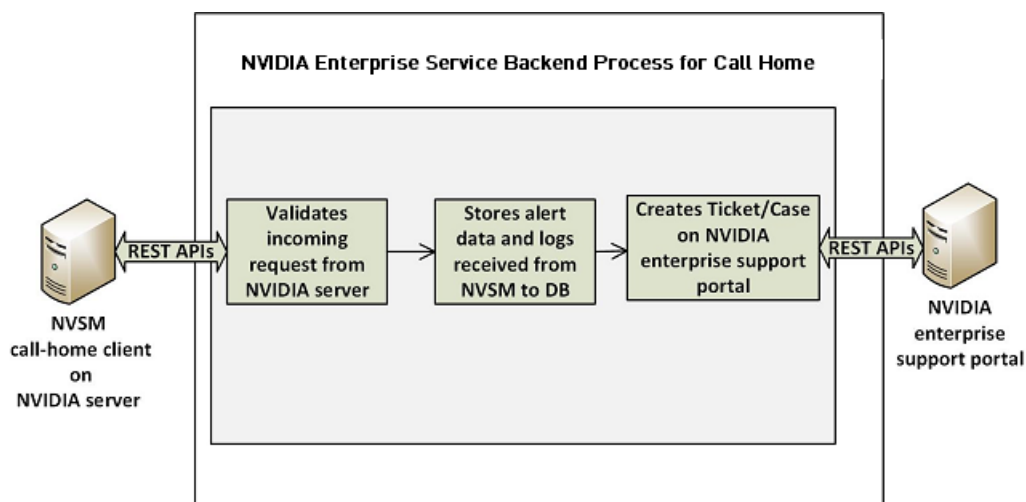
5.1. NVSM Call Home Overview

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 nvsmdump, 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:

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.

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.

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
  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 NVESD and creates a support case on behalf of the registered user.

Automatic Mode Syntax

To enable automatic mode, first configure the email contact.

```
$ sudo nvsm set /policy callhome_email_contact=<email>
```

then enable Call Home.

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

You can also configure the email contact and enable Call Home in the same command.

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

Automatic Mode Configuration Arguments

Configure NVSM Call Home using the following parameters:

► `callhome_email_contact`

Sets the 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`

(Optional) 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_email_contact=123@example.com callhome_enable=true
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.

Disabling Automatic Mode

The Call Home automatic mode will start listening for alerts and raise support cases in the background. If there are any maintenance activities such as reseating or swapping components that would cause NVSM to generate critical alerts, Call Home will raise support cases as well.

To avoid raising support cases during intentional maintenance activities, disable call-home by issuing the following.

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

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 perform 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 Configuration

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": ""  
  }  
]
```

Appendix A. Third-Party Licenses

This NVIDIA product contains third party software that is being made available to you under their respective open source software licenses. Some of those licenses also require specific legal information to be included in the product. This section provides such information.

`mattn/go-sqlite3`

The `mattn/go-sqlite3` software (<https://github.com/mattn/go-sqlite3>) is provided under the following terms:

```
The MIT License (MIT)
```

```
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```

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