# NVIDIA NVOS User Manual for InfiniBand Switches v25.02.6077

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Welcome to NVOS Documentation

NVIDIA NVOS operating system enables the management and configuration of NVIDIA's switch system platforms.
NVOS provides a suite of management options, incorporates a CLI and OpenAPI, which enables administrators to easily configure and manage the system.

These pages provide information about the scope, organization, and command-line interface of NVOS as well as configuration examples.

## Software Download

To download the latest software, log in to the following website: enterprise-support.nvidia.com/s/

For common questions about the Enterprise Account please see the following webpage: nvid.nvidia.com/NvidiaUtilities/#/needHelp

## Technical Support

Customers who purchased NVIDIA products directly from NVIDIA are invited to contact us through the following methods:

- URL: www.nvidia.com → Support
- E-mail: enterprisesupport@nvidia.com

Customers who purchased NVIDIA M-1 Global Support Services, please see your contract for details regarding Technical Support.
Customers who purchased NVIDIA products through an NVIDIA-approved reseller should first seek assistance through their reseller.

## Document Revision History

A list of the changes made to the User Manual is provided in Document Revision History section.

# 1 Overview

## 1.1 Intended Audience

These pages are intended for network administrators who are responsible for configuring and managing NVOS platforms.

## 1.2 Related Documentation

The following table lists the documents referenced in this user manual.

| Document Name | Description |
|---|---|
| System Hardware User Manual | This document contains hardware descriptions, LED assignments, and hardware specifications. |
| Switch Product Release Notes | Look up the relevant switch system/series release notes file. |

## 1.3 Terminology

| Term | Description |
|---|---|
| AAA | Authentication, Authorization, and Accounting<br>AAA is a security framework for controlling and tracking user access within a computer network. It is used for Authentication, Authorization, and Accounting:<br>• Authentication—verifies user credentials (username and password)<br>• Authorization—grants or refuses privileges to a user/client for accessing specific services<br>• Accounting—tracks network resources consumption by users |
| ARP | Address Resolution Protocol. A protocol or procedure that translates or connects IP addresses into fixed physical MAC addresses for communication over a local area network (LAN). |
| BIOS | Basic Input/Output System |
| BMC | Baseboard Management Controller |
| CPLD | Complex Programmable Logic Device |
| DHCP | Dynamic Host Configuration Protocol (DHCP) is an automatic configuration protocol used on IP networks. |
| ERoT | External Root of Trust |
| FTP/TFTP/sFTP | File Transfer Protocol (FTP) is a standard network protocol used to transfer files from one host to another over a TCP-based network, such as the Internet. |
| FPGA | Field Programmable Gate Arrays |
| Host | A host in networking is a device that is connected to a network and is able to communicate with other hosts on the network. |
| MAC | Media Access Control address. MAC address is a unique identifier assigned to network interfaces for communications on the physical network segment. MAC addresses are used for numerous network technologies and most IEEE 802 network technologies including Ethernet. |

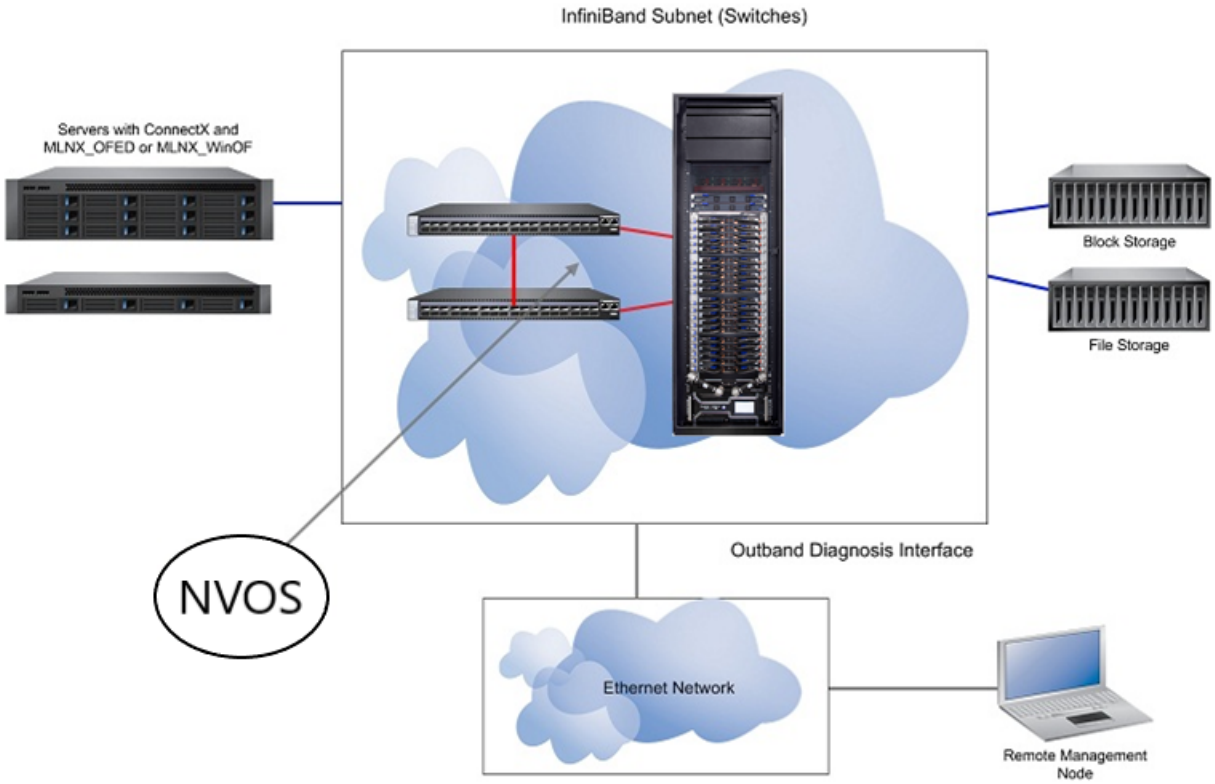
| Term | Description |
|---|---|
| MTU | Maximum Transfer Unit. The maximum size of a packet payload (not including headers) that can be sent /received from a port. |
| Network Adapter | A hardware device that allows for communication between devices in a network. |
| NTP | Network Time Protocol. A protocol for synchronizing computer clocks in a network. |
| RADIUS | Remote Authentication Dial In User Service. A networking protocol that enables AAA centralized management for computers to connect and use a network service. |
| SA | Subnet Agent. Every node in a cluster runs a subnet agent that talks to the subnet manager. |
| SCP | Secure Copy protocol. SCP is a means of securely transferring computer files between a local and a remote host or between two remote hosts. It is based on the Secure Shell (SSH) protocol. |
| SM | Subnet Manager. |
| SNMP | Simple Network Management Protocol. A network protocol designed for network management and the monitoring of network devices and their functions. |
| SSH | Secure Shell. A secure protocol designed to enable the authentication and execution of programs on remote machines via a network. This protocol verifies access to the remote system and ensures the encryption of data transferred over the connection |
| syslog | A standard for forwarding log messages in an IP network. |
| TACACS+ | Terminal Access Controller Access-Control System Plus. A networking protocol that enables access to a network of devices via one or more centralized servers. TACACS+ provides separate AAA services. |

## 1.4 System Features

| Feature | Detail |
|---|---|
| Software management | • Software updates<br>• Firmware updates |
| Logging | • System log<br>• Tech-support |
| Management interface | • IP<br>• DHCP<br>• Hostname |
| Chassis management | • Monitoring environmental controls |
| Network management interfaces | • OpenAPI |
| Security | • Password Hardening |
| Cables & transceivers | • Transceiver info |

## 1.5 InfiniBand Features

| Feature | Detail |
|---|---|
| Subnet manager | • OpenSM |
| IB port management | • IB port interfaces |
| IB Fabric | • IB devices |



# 2 Quick Start Guide


- 2.1 Prerequisites
- 2.2 Get Started
- 2.3 Manual Provisioning
  - 2.3.1 Login Credentials
  - 2.3.2 Serial Console Management
  - 2.3.3 Wired Ethernet Management
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    - 2.3.6.1 Manual Settings
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      - 2.3.6.2.2 Configure NTP Servers
  - 2.3.7 Configure Syslog Servers
- 2.4 Test Cable Connectivity
- 2.5 Configure Connection-Mode In an InfiniBand Interface


This quick start guide provides an end-to-end setup process for installing and running NVOS.

> ⚠ Before running NVUE commands, please refer to the NVIDIA User Experience (NVUE) section.

> ⚠ NVOS supports configurations through NVUE only. Running Linux commands or directly modifying underlying Linux files might result in undefined behavior.

## 2.1 Prerequisites

This guide requires an intermediate-level Linux knowledge. An understanding of text editing, Unix file permissions, and process monitoring is necessary. A variety of text editors are pre-installed, including `vi` and `nano`.

Access to a Linux or UNIX shell in needed. For Windows users, employing a Linux environment like Cygwin as your command line tool is recommended for interacting with NVOS.

> ⚠ If moving from MLNX-OS to NVOS operating system, please refer to the following appendix: Moving from MLNX-OS to NVOS.

## 2.2 Get Started

NVOS provides two methods for initial provisioning:

- Zero-Touch Provisioning (ZTP)

- Manual Provisioning

## 2.3 Manual Provisioning

When starting NVOS for the first time, the management port send a DHCP request. To determine the IP address of the switch, you can cross reference the MAC address of the switch with your DHCP server. The MAC address is typically located on the side of the switch or on the box in which the unit ships.

### 2.3.1 Login Credentials

The default installation includes two accounts:

- The user account (admin) has `sudo` privileges. The admin account uses the default password `admin`.
- The user account (monitor) has `read only` privileges. The monitor account uses the default password `monitor`.

Upon first login, it will be required to change the default passwords for the admin and monitor accounts. The new password must comply with the default password hardening rules (see Password Hardening section).

The new configured password is treated like any other configuration. If the configuration is not saved, the user will need to reconfigure it upon the system's next boot.

```
You are required to change your password immediately (administrator enforced).




WARNING: Your password has expired.
You must change your password now!
New password:
Retype new password:
```

In this quick start guide, use the *admin* account to configure NVOS.

All accounts except root can use remote SSH login. Note that the default SSH auto-logout is 15 minutes.

NVOS supports multiple services to authenticate users and authorize switch tasks, both local and remote authentication/authorization methods.
For more information, please refer to Authentication Authorization and Accounting section.

### 2.3.2 Serial Console Management

It is recommended to perform management and configuration over the network, either in-band or out-of-band. A serial console is fully supported.

Typically, switches ship from the manufacturer with a mating DB9 serial cable. Switches with ONIE are always set to a 115200 baud rate.

Recommended Serial Connection Settings

| Parameter | Setting |
|---|---|
| Baud Rate | 115200 |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | None |
| Flow Control | None |

## 2.3.3 Wired Ethernet Management

An NVOS switch always provides two dedicated Ethernet management port called eth0 and eth1. This interface is specifically for out-of-band management use. The management interface uses DHCP for addressing by default.

## 2.3.4 Set Static IP Address

To set a static IP address, run the following (ipv6 supported as well):

```
admin@nvos:~$ nv set interface eth0 ip address 192.0.2.42/24
admin@nvos:~$ nv set interface eth0 ip gateway 192.0.2.1
admin@nvos:~$ nv config apply
```

Configuring static IP address will trigger unsolicited announcement messages to the gateway in order to reveal the devices' MAC address.

## 2.3.5 Configure the Hostname

The hostname identifies the switch; as such, make sure the hostname is configured in a unique and descriptive way. For more information, see Hostname section.

## 2.3.6 Configure the System Clock

NVOS relies on the system clock for displaying the time and timestamping messages. User can control the system time zone and clock settings.

### 2.3.6.1 Manual Settings

#### 2.3.6.1.1 Time Zone

Default time zone is set to Coordinated Universal Time (UTC). User may change the time zone configuration by executing the following:

```
admin@nvos:~$ nv set system timezone Etc/UTC
admin@nvos:~$ nv config apply
```

#### 2.3.6.1.2 Clock

The system date and time can be manually changed. NTP servers configured on the switch will supersede any manually entered date-time settings.

```
admin@nvos:~$ nv action change system date-time 2024-12-24 10:25:13
```

### 2.3.6.2 NTP

NVOS supports Network Time Protocol (NTP) for synchronizing the time of the system.

#### 2.3.6.2.1 NTP Servers from DHCP

By default, NTP will obtain the NTP servers from DHCP. It is possible to disable it by executing the following:

```
admin@nvos:~$ nv set system ntp dhcp disabled
admin@nvos:~$ nv config apply
```

#### 2.3.6.2.2 Configure NTP Servers

A new NTP server can be added by executing the following:

```
admin@nvos:~$ nv set system ntp server 10.11.100.5
admin@nvos:~$ nv config apply
```

NTP can be configured to accept packets coming from an authenticated source only.
NTP authentication is disabled by default.
An authentication key may be created and used to authenticate incoming NTP packets. To ensure the key is utilized, the following conditions must be met:

- Enable NTP authentication

  ```
  admin@nvos:~$ nv set system ntp authentication enabled
  admin@nvos:~$ nv config apply
  ```

- Add a new NTP key, and associate it with the server:

  ```
  admin@nvos:~$ nv set system ntp key 15 value SECRET
  admin@nvos:~$ nv set system ntp key 15 trusted yes
  admin@nvos:~$ nv set system ntp server 10.11.100.5 key 15
  admin@nvos:~$ nv config apply
  ```

- NTP server must use the same key.

NVOS support various attributes for NTP servers and keys, for more infomation please see NTP Commands.

## 2.3.7 Configure Syslog Servers

User can configure the system to send syslog logs to a centralized logging server ( one or more):

```
admin@nvos:~$ nv set system syslog server 10.20.30.40
admin@nvos:~$ nv config apply
```

For more syslog configurations, please see Remote Logging section.

## 2.4 Test Cable Connectivity

By default, NVOS enables all data plane ports (every InfiniBand port).To view link status, run the `nv show interface` command or `nv show platform transceiver`.

> When running NVUE commands to configure the switch, run the `nv config save` command before you reboot. The command saves the applied configuration to the startup configuration so that the changes persist after the reboot.
> `admin@nvos:~$ nv config save`

## 2.5 Configure Connection-Mode In an InfiniBand Interface

The connection-mode attribute indicates to which peer this port is connected. This feature is dedicated to Q3200-RA system which can be connected to NDR systems (or older) and to XDR systems.
In case the port is connected to XDR systems, the connection-mode should be XDR. If it connected to NDR system, the connection-mode should be NDR. By default, all the ports are configured to connection-mode XDR.
When connecting port to NDR system, the port connection-mode needs to be changed with the set command (nv set interface link connection-mode) to 'ndr' in order to have link up with full functionality. Changing port connection-mode will move the port to down and up again when configuration ends.

# 3 Installation Management

This section describes how to manage, install, and upgrade NVOS.


- Installing a New NVOS Image
- Upgrading/Downgrading NVOS Image
- Upgrading System Firmware
- Installation Management Commands


## 3.1 Installing a New NVOS Image

The default password for the *admin* user account is `admin`.

It is recommended to change the default password when logging in for the first time. ONIE includes options that allow to change the default password for the *admin* account automatically when installing a new NVOS image. Refer to ONIE Installation Options.

A new NVOS image can be installed using ONIE—an open source project (equivalent to PXE on servers)—that enables the installation of network operating systems (NOS) on bare metal switches.

Before installing NVOS, the switch may be in one of the two following states:

1. The switch does not contain an image (the switch is only running ONIE).
2. NVOS is already on the switch, but NVUE commands are to be used to reinstall NVOS or upgrade to a newer version.

The sections below describe some of the different ways to install the NVOS image. Steps show how to install directly from ONIE (if no image is on the switch) and from NVOS (if the image is already on the switch). For additional methods to find and install the NVOS image, see the ONIE Design Specification.

To get into ONIE, you need to interrupt the GRUB countdown screen by pressing the "ESC" or "F4" key and choose the appropriate menu entry.

The NVOS image can be downloaded from the NVIDIA Enterprise Support Portal.

Installing the NVOS image is destructive. Configuration files on the switch are not saved, so copy them to a different server before installation.

In the following procedures, the following is possible:

- The NVOS image can be named using any of the ONIE naming schemes mentioned here
- The `sudo onie-install -h` command can be run to show the ONIE installer options

## 3.1.1 Install Using a DHCP/Web Server With DHCP Options

To install NVOS using a DHCP or web server *with* DHCP options, set up a DHCP/web server on a laptop and connect the eth0 management port of the switch to the laptop. After connecting the cable, the installation proceeds as follows:

1. The switch boots up and requests an IP address (DHCP request).
2. The DHCP server acknowledges and responds with DHCP option 114 and the location of the installation image.
3. ONIE downloads the NVOS image, installs, and reboots.
   NVOS should now be running.

> The most common way is to send DHCP option 114 with the entire URL to the web server (this can be the same system). However, there are other ways to use DHCP even if you do not have full control over DHCP. See the ONIE user guide for information on partial installer URLs and advanced DHCP options—both articles list more supported DHCP options.

Example DHCP configuration with an ISC DHCP server:

```
subnet 172.0.24.0 netmask 255.255.255.0 {
  range 172.0.24.20 172.0.24.200;
  option default-url = "http://172.0.24.14/onie-installer-x86_64";
}
```

Example DHCP configuration with dnsmasq (static address assignment):

```
dhcp-host=sw4,192.168.100.14,6c:64:1a:00:03:ba,set:sw4
dhcp-option=tag:sw4,114,"http://roz.rtplab.test/onie-installer-x86_64"
```

If a web server is not accessible, this free Apache example can be used.

## 3.1.2 Install Using a DHCP/Web Server Without DHCP Options

Follow the steps below if logging into the switch on a serial console (ONIE), or log in on the console or with SSH (Install from NVOS).

Install from ONIE

1. Place the NVOS image in a directory on the web server.

2. Run the `onie-nos-install` command:

```
ONIE:/ #onie-nos-install http://10.0.1.251/path/to/nvos-amd64-25.01.0002.bin
```

### 3.1.3 Install Using a Web Server With no DHCP

Follow the steps below if logging into the switch on a serial console (ONIE), or log in on the console or with SSH (Install from NVOS) but *no* DHCP server is available.

> ⚠ A console connection is needed to access the switch. This procedure cannot be performed remotely.

Install from ONIE

1. ONIE is in discovery mode. Disable discovery mode with the following command:

   ```
   onie# onie-discovery-stop
   ```

   On older ONIE versions, if the `onie-discovery-stop` command is not supported, run the following command:

   ```
   onie# /etc/init.d/discover.sh stop
   ```

2. Assign a static address to eth0 with the `ip addr add` command:

   ```
   ONIE:/ #ip addr add 10.0.1.252/24 dev eth0
   ```

3. Place the NVOS image in a directory on your web server.
4. Run the installer manually (because there are no DHCP options):

   ```
   ONIE:/ #onie-nos-install http://10.0.1.251/path/to/nvos-install-x86_64.bin
   ```

### 3.1.4 Install Using FTP Without a Web Server

Follow the steps below if your laptop is on the same network as the switch eth0 interface but *no* DHCP server is available.

Install from ONIE

1. Set up DHCP or static addressing for eth0. The following example assigns a static address to eth0:

   ```
   ONIE:/ #ip addr add 10.0.1.252/24 dev eth0
   ```

2. If static addressing is being used, disable ONIE discovery mode:

```
onie# onie-discovery-stop
```

On older ONIE versions, if the `onie-discovery-stop` command is not supported, run the following:

```
onie# /etc/init.d/discover.sh stop
```

3. Place the NVOS image into a TFTP or FTP directory.
4. If DHCP options are not being used, run one of the following commands (tftp for TFTP or ftp for FTP):

```
ONIE# onie-nos-install ftp://local-ftp-server/nvos-amd64-25.01.0002.bin
ONIE# onie-nos-install tftp://local-tftp-server/nvos-amd64-25.01.0002.bin
```

### 3.1.5 Install Using a Local File

Follow the steps below to install the NVOS image referencing a local file.

Install from ONIE

1. Set up DHCP or static addressing for eth0. The following example assigns a static address to eth0:

```
ONIE:/ #ip addr add 10.0.1.252/24 dev eth0
```

2. If you are using static addressing, disable ONIE discovery mode.

```
onie# onie-discovery-stop
```

On older ONIE versions, if the `onie-discovery-stop` command is not supported, run the following:

```
onie# /etc/init.d/discover.sh stop
```

3. Use scp (secure copy protocol) to copy the NVOS image to the switch.
4. Run the installer manually from ONIE:

```
ONIE:/ #onie-nos-install /path/to/local/file/nvos-amd64-25.01.0002.bin
```

Install from NVOS

1. Fetch the NVOS image on the switch.

```
admin@nvos:~$ nv action fetch system image scp://<username>:<password>@<ip-address>/var/www/html/
<new_image>
```

```
admin@nvos:~$ nv show system image files
Available image file
------------------------
nvos-amd64-25.01.0003.bin
```

2. From the NVOS command prompt, using NVUE command, install the new image and follow the instruction on the screen.

```
admin@nvos:~$ nv action install system image files nvos-amd64-25.01.0003.bin
Operation will reboot the system.
If you choose 'y', the system will install the image and reboot.
If you choose 'N', the operation will abort without installing the image and without rebooting the system.
Do you want to continue? [y/N]
```

3. After reboot, run `nv show system image` to review your images.

```
admin@nvos:~$ nv show system image
           operational
----------  -------------------
current     2
next        2
partition1
  build-id  nvos-25.02.1936
partition2
  build-id  nvos-25.02.2930-010
```

## 3.1.6 Installing using an image copied from the host machine

1. Copy the image from the host machine to the switch.

> ⚠ *Note: you must copy an image to the predefined directory: "/host/nos-images/"*

```
user@host:~$ scp <path-to-system-image> <switch-admin-username>@<switch-ip-address>:/host/nos-images/
<desired-name>.bin
```

2. To install the image login to the switch and perform steps 2-3 from the "Install from NVOS" section.

## 3.1.7 Install Using a USB Drive

Follow the steps below to install the NVOS image using a USB drive.

> ⚠ Tip: Installing NVOS using a USB drive is not scalable. DHCP can scale to hundreds of switch installs with zero manual input, unlike USB installs.

### 3.1.7.1 Prepare for USB Installation

1. From a computer, prepare your USB drive by formatting it using one of the supported formats: FAT32, vFAT, or EXT2.

   Optional: Prepare a USB drive inside NVOS

   a. Insert the USB drive into the USB port on the switch running NVOS and log in to the switch. Examine output from `cat /proc/partitions` and `sudo fdisk -l [device]` to determine the location of your USB drive. For example, `sudo fdisk -l /dev/sdb`. These instructions assume the USB drive is the `/dev/sdb` device, which is typical if inserting the USB drive after the machine is already booted. However, if the USB drive

was inserted during the boot process, it is possible that the USB drive is the `/dev/sda` device. Make sure to modify the commands below to use the proper device for the USB drive.

b. Create a new partition table on the USB drive. If the `parted` utility is not on the system, install it with `sudo -E apt-get install parted`.

```
sudo parted /dev/sdb mklabel msdos
```

c. Create a new partition on the USB drive:

```
sudo parted /dev/sdb -a optimal mkpart primary 0% 100%
```

d. Format the partition to your filesystem of choice using *one* of the examples below:

```
sudo mkfs.ext2 /dev/sdb1
sudo mkfs.msdos -F 32 /dev/sdb1
sudo mkfs.vfat /dev/sdb1
```

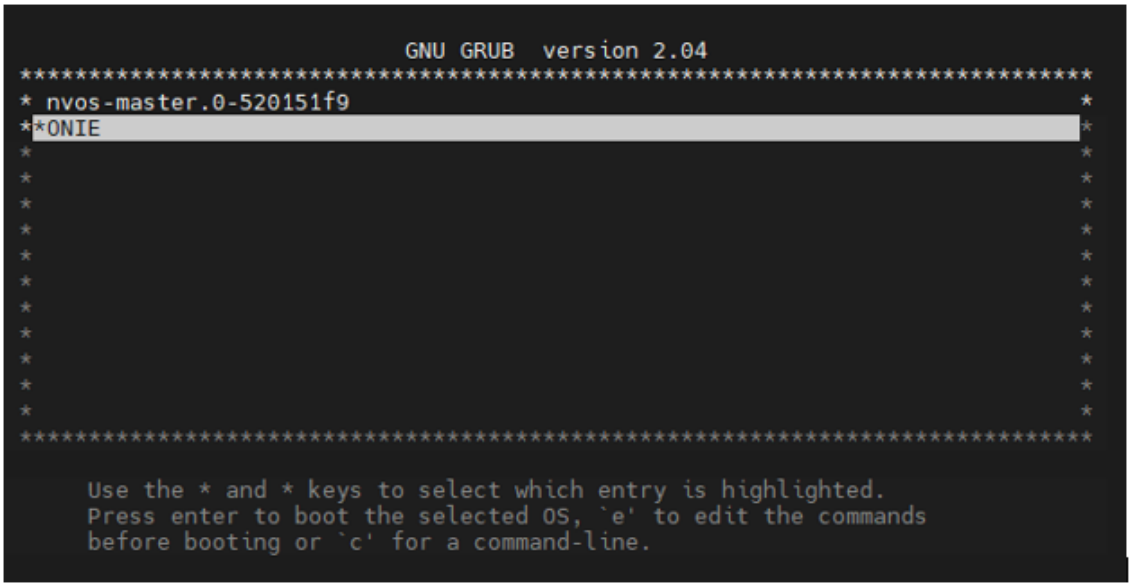
To use `mkfs.msdos` or `mkfs.vfat`, installation of the `dosfstools` package from the Debian software repositories is needed, as they are not included by default.

e. To continue installing NVOS, mount the USB drive to move files:

```
sudo mkdir /mnt/usb
sudo mount /dev/sdb1 /mnt/usb
```

2. Copy the NVOS image to the USB drive, then rename the image file to `onie-installer-x86_64`.
   Any of the ONIE naming schemes mentioned here can also be used.
   When using a MAC or Windows computer to rename the installation file, the file extension can still be present. Make sure to remove the file extension so that ONIE can detect the file.
3. Insert the USB drive into the switch, then prepare the switch for installation:
   - If the switch is offline, connect to the console and power on the switch
   - If the switch is already online in ONIE, use the `reboot` command

   SSH sessions to the switch get dropped after this step. To complete the remaining instructions, connect to the console of the switch. NVOS switches display their boot process to the console; you need to monitor the console specifically to complete the next step.
4. Monitor the console and interrupt the GRUB countdown with the "ESC" or "F4" key when proposed, then select the ONIE option from the first GRUB screen shown below.




5. NVOS on x86 uses GRUB chainloading to present a second GRUB menu specific to the ONIE partition. No action is necessary in this menu to select the default option `ONIE: Install OS`.

6. The switch recognizes the USB drive and mounts it automatically. NVOS installation begins.
7. After installation completes, the switch automatically reboots into the newly-installed instance of NVOS.

### 3.1.8 Initial login

Once the NVOS image is successfully installed on the system, logging into the operating system becomes possible.

During the initial login to the NOS, a password change will be requested. This can be achieved by connecting to the switch via SSH and changing the password following the relevant message prompts.

> ⚠ Once the password has been changed, please save your configuration in order to retain the password during subsequent reboots.
> If the switch is being managing only via ZTP, disregard the password change request.

```
You are required to change your password immediately (administrator enforced).

WARNING: Your password has expired.
You must change your password now!
New password:
Retype new password:
```

### 3.1.9 Related Information

- ONIE Design Specification

## 3.2 Upgrading/Downgrading NVOS Image

The following pages provide information on upgrading and downgrading the operating system version on the device.

- Upgrading Operating System Software
- Deleting Unused Images

### 3.2.1 Upgrading Operating System Software

#### 3.2.1.1 Important Notes Before Upgrading OS Software

Consider the following items prior to upgrading the operating system:

- The system becomes unavailable while OS upgrade is in progress.
- The upgrade procedure burns the software image as well as the firmware.
- Before upgrading the software image, make sure to close all CLI sessions besides the one used to run the upgrade process.

#### 3.2.1.2 In Service Software Upgrade (ISSU):

ISSU is a method to update the switch NOS software bundle, to a newer version then the currently running version, without disrupting the forwarding of traffic through the switch.

During the upgrade, the control and management planes incur unavailability while moving to the new OS version and refreshing the internal software databases.

However, the switch ASIC(s) are still forwarding traffic and keeping all physical and logical ports uninterrupted, even while the firmware inside the ASIC is being updated.

The ISSU flow involves interaction with the Subnet Manager (SM) to get its approval to launch ISSU.

The command to issue ISSU is the same command to perform regular software update with two additional flags

```
admin@nvos:~$ nv action install system image files new-nvos-image.bin ?

    [Enter]
    reboot                  Install an image and reboot system
    force                   Force system reboot after system image installation
    issu                    Install image in ISSU mode
    skip-sm                 Skip SM confirmation for ISSU
```

Additionally on systems that support ISSU, its status will be included in `nv show system image` output.

```
admin@nvos:~$ nv show system image
            operational          applied
----------  -------------------  -------
current     <old_image>
next        <old_image>
partition1  <old_image>
issu-status in-progress
```

adding issu flag would trigger this flow and avoid the reboot.

skip-sm should be used only when there is a need to perform ISSU while SM is not available. This needs special care in a production environment.

ISSU is disabled by default on OpenSM, and needs a special configuration to enable it, please refer to OpenSM release notes.

### 3.2.1.3 Upgrading OS Software

To upgrade NVOS, perform the following steps.

1. Display the image (.bin file) that is currently available.

   ```
   admin@nvos:~$ nv show system image
               operational          applied
   ----------  -------------------  -------
   current     <old_image>
   next        <old_image>
   partition1  <old_image>
   ```

2. In case there are partition1 and partition2, Uninstall the image that isn't used as 'current' or 'next' prior to fetching the new image. Use the command `nv action uninstall system image,` for this purpose.

   ```
   admin@nvos:~$ nv action uninstall system image
   ```

   Another option is to clean-up all the unused images.

   ```
   admin@nvos:~$ nv action uninstall system image force
   ```

3. Upload the new software image to the system using fetch command.

```
admin@nvos:~$ nv action fetch system image scp://<username>:<password>@<ip-address>/var/www/html/
<new_image>
```

4. Install the new image.

```
admin@nvos:~$ nv action install system image files new-nvos-image.bin
Operation will reboot the system.
If you choose 'y', the system will install the image and reboot.
If you choose 'N', the operation will abort without installing the image and without rebooting the system.
Do you want to continue? [y/N]
```

5. After reboot, display available images and verify that the new image now appears.

```
admin@nvos:~$ nv show system image
             operational          applied
----------   -------------------   -------
current      2
next         2
partition1
  build-id   <old_image>
partition2
  build-id   <new_image>
```

- After software reboot, the software upgrade will also automatically upgrade the firmware version.
- To recover from image corruption (e.g., due to power interruption), there are two installed images on the system. For more information, see the `nv action boot-next system image` command.

### 3.2.2 Deleting Unused Images

To delete unused images, conduct the following steps:

1. Get a list of the unused images.

```
admin@nvos:~$ nv show system image
             operational
-----------  ---------------
current      1
next         1
issu-status  no-issu
partition1
  build-id   nvos-xx
```

2. Uninstall the unused images.

```
admin@nvos:~$ nv action uninstall system image
```

## 3.3 Upgrading System Firmware


- 3.3.1 Upgrade ASIC Firmware
  - 3.3.1.1 ASIC Firmware Change
- 3.3.2 Upgrade Components Firmware
  - 3.3.2.1 Component Image Update Using NVOS CLI
    - 3.3.2.1.1 Transceiver Firmware Upgrade
  - 3.3.2.2 Component Image Update Using RestAPI

- 3.3.2.2.1 REST API Commands
- 3.3.2.3 Error Status Catalog


NVOS provides the ability to upgrade the Firmware of system components manually.

## 3.3.1 Upgrade ASIC Firmware

NVOS is bundled with a default ASIC firmware version. When updating the operating system software to a new version, an automatic firmware update process will be attempted by NVOS. The user can choose to override the default version.
To perform an automatic firmware update by the OS for a different switch firmware version without changing the OS version, import and install the firmware package as described below. The OS sets it as the new default firmware and performs the firmware update automatically.

### 3.3.1.1 ASIC Firmware Change

1. Display the ASIC firmware that is currently available.

```
admin@nvos:~$ nv show platform firmware ASIC
                operational         applied
---------------  ------------------  -------
part-number      MQM9700-NS2X-NS_Ax
actual-firmware  31.2014.0946
auto-update      enabled             enabled
fw-source        default             default
```

2. Import the firmware image (.mfa file) to the switch.

```
admin@nvos:~$ nv action fetch platform firmware ASIC /path/to/fw-image.mfa
```

Alternatively, you can upload the FW file from the host to the switch:

> The firmware file must be copied to the predefined directory: "/host/fw-images/asic"

```
user@host:~$ scp <path-to-fw-file> <switch-admin-username>@<switch-ip-address>:/host/fw-images/asic/
<desired-name>.mfa
```

3. Configure default firmware source from user.

```
admin@nvos:~$ nv set platform firmware ASIC fw-source custom
```

4. Display system firmware component information.

```
admin@nvos:~$ nv show platform firmware ASIC
                operational         applied
---------------  ------------------  -------
part-number      MQM9700-NS2X-NS_Ax
actual-firmware  31.2014.0946
auto-update      enabled             enabled
fw-source        default             default
```

5. Apply the configuration

```
admin@nvos:~$ nv config apply
```

6. Save the configuration.

```
admin@nvos:~$ nv config save
```

7. Install the firmware image.

```
admin@nvos:~$ nv action install platform firmware ASIC files fw-image.mfa
The operation will initiate a component firmware update.
Type [y] to install the firmware and reboot afterwards.
Type [N] to install the firmware without reboot.

Do you want to reboot? [y/N]
```

8. Press 'Y' will cause system reboot to install and activate firmware.
9. Press 'N' requires manual reboot from user later on.

```
admin@nvos:~$ nv action reboot system
```

## 3.3.2 Upgrade Components Firmware

This section provides step-by-step instructions to manually check and update software and firmware on InfiniBand switch to ensure the system is up to date with the latest software and firmware versions.

- These updates are not done every release. See NVIDIA NVOS Release Notes to see which versions should be used.
- The upgrade process will require maintenance window.
- If necessary, retrieve logs for customer support using the command "nv action generate system tech-support".

### 3.3.2.1 Component Image Update Using NVOS CLI

Firmware updates can be done by NVOS CLI commands. CLI commands are blocking, meaning each command must be finished before another one can be.

There are two stages to upgrade each component:

1. Fetching a file from the unpacked bundle.

```
admin@nvos:~$ nv action fetch platform firmware <component-id> <remote-url>
```

For details, see nv action fetch platform firmware.

2. Installing a component:

```
admin@nvos:~$ nv action install platform firmware <component-id> files <file-name>
```

For details, see nv action install platform firmware files.

- <component-id> can be one of the following: ASIC, BIOS, and CPLD1.
- Once upgrading a specific CPLD, all other CPLDs will be upgraded as well.
- CPLD firmware bundle should include two different files: burn and refresh.

1. After installation, the switch will reboot automatically if the "skip-reboot" flag was not set.

   Recommended flow for CPLD upgrade:

   a. Install burn file with skip-reboot flag:

   ```
   admin@nvos:~$ nv action install platform firmware CPLD1 files burn.vme skip-reboot
   ```

   b. Install refresh file:

   ```
   admin@nvos:~$ nv action install platform firmware CPLD1 files refresh.vme
   ```

   The system will perform a power cycle automatically.

2. To verify firmware versions after system boot, run the following:

   ```
   admin@nvos:~$ nv show platform transceiver <transceiver-id> firmware
   ```

   For details, see nv show platform firmware.

#### 3.3.2.1.1 Transceiver Firmware Upgrade

Firmware updates can be done by NVOS CLI commands. CLI commands are blocking, meaning each command must be finished before another one can be.

There are two stages to upgrade each component:

1. Fetching a file from the unpacked bundle.

   ```
   admin@nvos:~$ nv action fetch platform firmware transceiver <file-path>
   ```

   For details, see nv action fetch platform firmware.

2. Installing transceiver firmware.

   ```
   admin@nvos:~$ nv action install platform transceiver <transceiver-id> firmware files <file-name>
   ```

   For details, see nv action install platform transceiver firmware files.

In order to activate the transceiver firmware, NVOS will reset the transceiver as part of the install action.

To verify firmware version, run the following:

```
admin@nvos:~$ nv show platform transceiver <transceiver-id> firmware
```

For details, see nv show platform transceiver firmware.

### 3.3.2.2 Component Image Update Using RestAPI

RestAPI can be used from remote server to perform operations on the switch.
RestAPI is not blocking, meaning command can be sent before the previous finished. To deal with this nature, each command returns Task ID, use the Task ID to query for the result between the commands. State of “action_success” means the operation ended successfully.

Upgrades consist of fetch, install, and power cycle at the end of the entire process.

#### 3.3.2.2.1 REST API Commands

Query command, should be executed between commands:

```
admin@nvos:~$ curl -k --user <nvos-user>:<nvos-password> --request GET 'https://<switch-ip>/nvue_v1/action/<task-id>'
```

- Fetching component image file:

```
admin@nvos:~$ curl -k --user <nvos-user>:<nvos-password> --request POST 'https://<switch-ip>/nvue_v1/platform/firmware/<component>' -H 'Content-Type: application/json' -d '{"@fetch": {"state": "start", "parameters": {"remote-url": "scp://<server-user>:<<server-password> >@<PATH_TO_FILE>"}}}'
```

- Install the component file:

```
admin@nvos:~$ curl -k --user <nvos-user>:<nvos-password> --request POST 'https://<switch-ip>/nvue_v1/platform/firmware/<component>/files/</<file-name>' -H 'Content-Type: application/json' -d '{"@install": {"state": "start", "parameters": {"force": false}}}'
```

- After system boot, check firmware version:

```
admin@nvos:~$ curl -k --user <nvos-user>:<nvos-password> --request GET 'https://<nvos-ip>/nvue_v1/platform/firmware'
```

### 3.3.2.3 Error Status Catalog

Use the table below to identify the errors and their meaning.

Bundles List

| BIOS | |
|---|---|
| **Scenario** | **Error** |
| Selected file for installation doesn't exist | Failed to install BIOS firmware file: No such firmware |
| Bad or corrupted file | Invalid file: /host/fw-images/bios/bad_file.cab |
| Bad Onie version | ERROR: ONIE {} or later is required |
| Failed to enable ONIE firmware update mode | ERROR: failed to enable ONIE firmware update mode |
| Failed to disable ONIE firmware update mode | ERROR: failed to disable ONIE firmware update mode |

| | |
|---|---|
| Installation script was interrupted by signal | WARNING: Interrupted by ${_sig}: disable ONIE firmware update mode |
| **CPLD** | |
| **Scenario** | **Error** |
| Selected file for installation doesn't exist | Failed to install CPLD firmware file: No such firmware |
| Bad or corrupted file | Invalid file: /host/fw-images/cpld/bad_file.vme |
| MST service not started (never started or failed to start) | ERROR: mst driver is not loaded |
| MST device path doesn't exist or failed to it | ERROR: Failed to get mst device: pattern={}, devices={} |
| CPLD update command failed | ERROR: Failed to update {} firmware: {} |

# 3.4 Installation Management Commands


- 3.4.1 Version
  - 3.4.1.1 nv show system version
- 3.4.2 Image
  - 3.4.2.1 nv show system image
  - 3.4.2.2 nv show system version image
  - 3.4.2.3 nv show system version packages installed
  - 3.4.2.4 nv show system version packages installed id
  - 3.4.2.5 nv show system image files
  - 3.4.2.6 nv action fetch system image
  - 3.4.2.7 nv action install system image files
  - 3.4.2.8 nv action rename system image files
  - 3.4.2.9 nv action upload system image files
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- 3.4.3 Firmware
  - 3.4.3.1 nv show platform firmware
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  - 3.4.3.7 nv action rename platform firmware files
  - 3.4.3.8 nv action fetch platform firmware
  - 3.4.3.9 nv action upload platform firmware files

## 3.4.1 Version

### 3.4.1.1 nv show system version

| | |
|---|---|
| | nv show system version<br>Displays system version information, including 'base-os' and 'product-release'. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.5002 Updated output |
| Example | <br>`admin@nvos:~$ nv show system version`<br>`operational`<br>`---------- ----------`<br>`kernel 5.10.0-30-2-amd64`<br>`build-date Wed Jun 18 15:19:56 UTC 2025`<br>`image nvos-25.02.4014`<br>`onie 2025.05-5.3.0017-115200` |
| REST API | GET https://<ip>/nvue_v1/system/version |
| Related Commands | nv show system<br>nv show system image |
| Notes | |

## 3.4.2 Image

### 3.4.2.1 nv show system image

| | |
|---|---|
| | nv show system image<br>Show system image information.<br>Display version information related to system image. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |
| Example | <br>`admin@nvos: ~$ nv show system image`<br>`operational`<br>`----------- ---------------`<br>`current 1`<br>`next 1`<br>`issu-status no-issu`<br>`partition1`<br>`build-id nvos-25.02.4014` |
| REST API | GET https://<ip>/nvue_v1/system/image |
| Related commands | nv show system image files |
| Notes | |

### 3.4.2.2 nv show system version image

| | |
|---|---|
| | nv show system version image<br>Displays information about the system's boot image. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.5002 |
| Example | <br>admin@nvos: ~$ nv show system version image<br><br>operational<br>---------- ----------<br>build-id nvos-25.02.2988-001<br>build-date Wed Mar 5 11:23:22 UTC 2025 |
| REST API | GET https://<ip>/nvue_v1/system/version/image |
| Related commands | |
| Notes | |

### 3.4.2.3 nv show system version packages installed

| | |
|---|---|
| | nv show system version packages installed<br>Lists all currently installed software packages on the system. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.5002 |
| Example | <br>admin@nvos: ~$ nv show system version packages installed<br><br>Installed Software Description Package Version<br>--- --- --- ---<br>acpi displays information on ACPI devices acpi 1.7-1.2 |
| REST API | GET https://<ip>/nvue_v1/system/version/packages/installed |
| Related commands | |
| Notes | |

### 3.4.2.4 nv show system version packages installed id

| | |
|---|---|
| | nv show system version packages installed <installed-id><br>Displays detailed information about a specific installed software package. Replace with the actual package name. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.5002 |

| | |
|---|---|
| Example | <br>`admin@nvos: ~$ nv show system version packages installed acl`<br><br>`  operational`<br>`----------  ------------------------------`<br>`package  acl`<br>`version  2.2.53-10`<br>`description  access control list - utilities` |
| REST API | GET https://<ip>/nvue_v1/system/version/packages/installed/<installed-id> |
| Related commands | |
| Notes | |

### 3.4.2.5 nv show system image files

| | |
|---|---|
| | nv show system image files<br>Show files in the image directory on the switch file system. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show system image files`<br>`Available image file`<br>`----------`<br>`nvos-amd64-25.01.2434-013.bin`<br>`nvos-amd64-25.01.2504.bin` |
| REST API | GET https://<ip>/nvue_v1/system/image/files |
| Related commands | nv show system image |
| Notes | |

### 3.4.2.6 nv action fetch system image

| | | |
|---|---|---|
| | nv action fetch system image <remote-url><br>Fetch/download a file from a remote server and stores it locally. | |
| Syntax Description | remote-url | • Remote url path to fetch file from.<br>• Format: [protocol]://username[:password]@hostname/path/filename<br>• Supported protocols: SCP, HTTPS, FILE, FTP, and SFTP.<br>• The password must be encoded if it contains special characters and is provided as part of the command. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv action fetch system image scp://my_user:my_password@server/path/image.bin`<br>`admin@nvos:~$ nv action fetch system image https://some.domain.com/path/image.bin`<br>`admin@nvos:~$ nv action fetch system image file:///path/image.bin` | |
| REST API | POST https://<ip>/nvue_v1/system/image | |
| Related Commands | nv show system image files | |

| | |
|---|---|
| Notes | Using https requires the remote server to have a valid CA certificate. |

### 3.4.2.7 nv action install system image files

| | | |
|---|---|---|
| | nv action install system image files {image-file} [force] [reboot <yes/no>]<br>Install system image from a binary file and reboot the system. | |
| Syntax Description | image-file | Path to the binary file to install on the OS filesystems |
| | force | Force the action without asking for user confirmation |
| | reboot | Install image with or without system reboot |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv action install system image files nvos.bin
The operation will install the image and initiate a reboot.
Type [y] to install the image and reboot.
Type [N] to abort.


Do you want to continue? [y/N] N
Image install aborted by user
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/image/files/ |
| Related commands | nv show system image |
| Notes | Executing the command for an image that is already installed on the other partition will not install the image again, it will only change the "boot-next" image. |

### 3.4.2.8 nv action rename system image files

| | | |
|---|---|---|
| | nv action rename system image files <image> <new-name><br>Rename an image file. | |
| Syntax Description | image | Source image file name |
| | new-name | Destination image file name |
| Default | N/A | In case of an empty parameter performs a regular reboot without force. |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv action rename system image files old_name.img new_name.img
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/image/files/<file-name> |
| Related Commands | nv show system image files |
| Notes | |

### 3.4.2.9 nv action upload system image files

| | | |
|---|---|---|
| | nv action upload system image files <image> <remote-url><br>Upload an image file to remote location. | |
| Syntax Description | image | Image file to upload |

| | | |
|---|---|---|
| | remote-url | Destination image file name<br>Remote url path to upload a file to.<br>Format: [protocol]://username[:password]@hostname/path/filename<br>Supported protocols: SCP, FTP, SFTP, and HTTPS |
| Default | N/A | |
| History | 25.02.2002<br>25.02.4002 Added HTTPS support in remote-url | |
| Example | admin@nvos:~$ nv action upload system image image_file.bin scp://my_user:my_password@server/path/image_file.bin | |
| REST API | POST https://<ip>/nvue_v1/system/image/files/<file-name> | |
| Related commands | nv show system image files | |
| Notes | | |

### 3.4.2.10 nv action uninstall system image

| | |
|---|---|
| | nv action uninstall system image<br>Removes old unused images that are not current or boot-next. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | admin@nvos:~$ nv action uninstall system image<br>Cleaning up old unused images...<br>Removing image nvos-old<br>Images cleanup done<br>Action succeeded<br><br>admin@nvos:~$ nv action uninstall system image<br>Cleaning up old unused images...<br>No image(s) to cleanup<br>Action succeeded |
| REST API | POST https://<ip>/nvue_v1/system/image |
| Related commands | nv show system image |
| Notes | |

### 3.4.2.11 nv action delete system image files

| | | |
|---|---|---|
| | nv action delete system image files <image><br>Delete an image from file system. | |
| Syntax Description | image | Image file name |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv action delete system image files nvos.bin | |

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/image/files/<file-name> |
| Related Commands | nv show system image files |
| Notes | |

### 3.4.2.12 nv action uninstall system image force

| | | |
|---|---|---|
| | nv action uninstall system image force<br>Uninstall the system image.<br>Uninstall old unused images that are not current image. | |
| Syntax Description | image-id | System image identifier |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv action uninstall system image force<br>Uninstalling system image: nvos<br>Image nvos uninstalled successfully<br>Action succeeded<br><br>admin@nvos:~$ nv action uninstall system image<br>Uninstalling system image: nvos<br>Action failed with the following issue:<br>Image nvos can't be uninstalled. Image does not exist | |
| REST API | POST https://<ip>/nvue_v1/system/image | |
| Related commands | nv show system image | |
| Notes | Image ID can be retrieved by the "nv show system image" command. | |

### 3.4.2.13 nv action boot-next system image

| | | |
|---|---|---|
| | nv action boot-next system image <image-id><br>Set boot-next system image.<br>Set image to boot from at the next boot. | |
| Syntax Description | image-id | System image identifier |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv action boot-next system image nvos<br>Setting system image nvos as boot-next..<br>Image nvos set as boot-next<br>Action succeeded<br><br>admin@nvos:~$ nv action boot-next system image nvos<br>Setting system image nvos as boot-next..<br>Action failed with the following issue:<br>Failed to set boot-next: Image nvos does not exist | |
| REST API | POST https://<ip>/nvue_v1/system/image | |
| Related commands | nv show system image | |

| | |
|---|---|
| Notes | • Image ID can be retrieved by "nv show system image" command.<br>• Select which partition to boot from.<br>• Booting to an image with existing DB (with an image that is not freshly installed), will not migrate the configurations from the current image. |

## 3.4.3 Firmware

### 3.4.3.1 nv show platform firmware

| | |
|---|---|
| | nv show platform firmware<br>Show platform firmware information.<br>Show firmware information for platform components like ASIC, BIOS, SSD, CPLD, and transceiver. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | admin@nvos:~# nv show platform firmware<br>Name Actual FW Part Number FW Source<br>---------- ---------- ---------- ---------<br>ASIC 31_2012_2906-032 MQM9700-NS2X-NS_Ax default<br>BIOS 0ACQF_06.01.002 N/A N/A<br>CPLD1 CPLD000232_REV0700 N/A N/A<br>CPLD2 CPLD000324_REV0300 N/A N/A<br>CPLD3 CPLD000000_REV0000 N/A N/A<br>SSD 0202-002 StorFly VSFBM4XC016G-MLX2 N/A<br>transceiver N/A N/A N/A |
| REST API | GET https://<ip>/nvue_v1/platform/firmware |
| Related commands | |
| Notes | |

### 3.4.3.2 nv show platform firmware id

| | | |
|---|---|---|
| | nv show platform firmware <component-id><br>Show platform firmware information for specific component.<br>Show firmware information for platform components such as ASIC, BIOS, CPLD, SSD, and transceiver. | |
| Syntax Description | component-id | Platform component name: ASIC, BIOS, CPLD1, SSD, and transceiver.<br>For systems with BMC, additional firmware components are supported: EROT, FPGA, BMC. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show platform firmware ASIC<br>operational applied<br>---------- ---------- -------<br>part-number MQM9700-NS2X-NS_Ax<br>actual-firmware 31_2012_2906-032<br>auto-update enabled<br>fw-source default | |
| REST API | GET https://<ip>/nvue_v1/platform/firmware/<component-id> | |
| Related Commands | nv show platform firmware | |

| | |
|---|---|
| Notes | |

### 3.4.3.3 nv show platform firmware files

| | | |
|---|---|---|
| | nv show platform firmware <component-id> files<br>Display the list of available firmware files for specific component.<br>Display the list of available firmware files for platform components such as ASIC, BIOS, CPLD and transceiver. | |
| Syntax Description | component-id | Platform component name: ASIC, BIOS, CPLD, and transceiver. For system with BMC, more firmware like EROT/FPGA/BMC are supported. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show platform firmware ASIC files
Available firmware files          File path
--------------------------------  ------------------------------------------------
fw-QTM2-rel-31_2012_3008-EVB.mfa  /host/fw-images/fw-QTM2-rel-31_2012_3008-EVB.mfa

admin@nvos:~$ nv show platform firmware transceiver files
Available Firmware Files        File Path
-----------------------------  -----------------------------------------------------
fw_47_150_03003_dev_signed.bin  /host/fw-images/module/fw_47_150_03003_dev_signed.bin
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/firmware/{component-id}/files |
| Related commands | nv show platform firmware<br>nv action install platform firmware <component-id> files <file-name><br>nv action install platform transceiver <transceiver-id> firmware files <file-name> |
| Notes | |

### 3.4.3.4 nv set/unset platform firmware

| | | |
|---|---|---|
| | nv set platform firmware [ASIC \| BIOS] [auto-update {enabled,disabled} \| fw-source {default,custom}]<br>nv unset platform firmware [ASIC \| BIOS] [auto-update {enabled,disabled} \| fw-source {default,custom}]<br>Update the platform ASIC or BIOS component configuration. | |
| Syntax Description | auto-update | Firmware component auto-update state |
| | fw-source | Firmware component default source |
| Default | auto-update | ASIC: enabled<br>BIOS: disabled |
| | fw-source | default |
| History | 25.02.2002<br>25.02.6077 Updated auto-update BIOS default to "disabled" | |
| Example | | |

```
admin@nvos:~$ nv set platform firmware ASIC fw-source custom
admin@nvos:~$ nv set platform firmware ASIC auto-update disabled
```

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/platform/firmware/ASIC |
| Related commands | |
| Notes | The configuration on BIOS is not available on system with BMC. |

### 3.4.3.5 nv action install platform firmware files

| | | |
|---|---|---|
| | nv action install platform firmware <component_id> files <file_path> [force] [skip-reboot]<br>Install platform firmware image.<br>ASIC Image will be installed to stage location and will be installed at the next reboot time. | |
| Syntax Description | component_id | Platform component name: ASIC, BIOS, CPLD1, SSD, and transceiver.<br>For systems with BMC, additional firmware components are supported: EROT, FPGA, BMC. |
| | file_path | Path to the firmware file. |
| | force | Force the action without asking for user confirmation. |
| | skip-reboot | Skip reboot after firmware installation. If force was specified, the reboot will still be skipped. |
| | | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action install platform firmware ASIC files/tmp/fw-QTM2.mfa`<br>`Installing firmware: /tmp/fw-QTM2.mfa`<br>`Firmware fw-QTM2.mfa successfully installed`<br>`Action succeeded` | |
| REST API | POST https://<ip>/nvue_v1/platform/firmware/{platform-component-id}/files/{file-name} | |
| Related commands | nv set/unset platform firmware ASIC auto-update<br>nv action reboot system | |
| Notes | • ASIC Image will be installed to stage location and will be installed at the next reboot time<br>• Installation respects "auto-update" and "fw-source" configuration<br>• To install firmware on a transceiver, use the following command: nv action install platform transceiver firmware files<br>• After installing firmware, initiating system reboot via the "nv action reboot system" command will perform a power-cycle to load the new firmware. | |

### 3.4.3.6 nv action delete platform firmware files

| | | |
|---|---|---|
| | nv action delete platform firmware <component-id> files <file-name><br>Delete firmware file from the filesystem for specific component such as ASIC, BIOS, CPLD and transceiver. | |
| Syntax Description | file-name | firmware file name |
| | component-id | Platform component name: ASIC, BIOS, CPLD, and transceiver. For system with BMC, more firmware like EROT/FPGA/BMC are supported. |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv action delete platform firmware ASIC files fw-test.mfa`<br>`File delete successfully`<br>`Action succeeded`<br><br>`admin@nvos:~$ nv action delete platform firmware transceiver files fw-test.bin`<br>`File delete successfully`<br>`Action succeeded` |
| REST API | POST https://<ip>/nvue_v1/platform/firmware/{component-id}/files/{file-name} |
| Related commands | nv show platform firmware <component-id> files<br>nv action fetch platform firmware <component-id> <url><br>nv action upload platform firmware <component-id> files <file-name> <remote-url><br>nv action rename platform firmware <component-id> files <file-name> <new-name><br>nv action install platform firmware <component-id> files <file-name> [force]<br>nv show platform transceiver <transceiver-id> firmware<br>nv action install platform transceiver <transceiver-id> firmware files |
| Notes | |

### 3.4.3.7 nv action rename platform firmware files

| | | |
|---|---|---|
| | nv action rename platform firmware <component-id> files <file-name> <new-name><br>Rename available firmware file for platform components such as ASIC, BIOS, CPLD and transceiver. | |
| Syntax Description | file-name | Firmware file name |
| | new-name | New name for firmware file |
| | component-id | Platform component name: ASIC, BIOS, CPLD, and transceiver. For system with BMC, more firmware like EROT/FPGA/BMC are supported. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action rename platform firmware ASIC files fw-QTM.mfa new-fw-QTM.mfa`<br>`File renamed successfully`<br>`Action succeeded`<br><br>`admin@nvos:~$ nv action rename platform firmware transceiver files fw-test.bin new-fw-test.bin`<br>`File renamed successfully`<br>`Action succeeded` | |
| REST API | POST https://<ip>/nvue_v1/platform/firmware/{component-id}/files/{file-name} | |
| Related commands | nv show platform firmware <component-id> files<br>nv action fetch platform firmware <component-id> <url><br>nv action upload platform firmware <component-id> files <file-name> <remote-url><br>nv action delete platform firmware <component-id> files <file-name><br>nv action install platform firmware <component-id> files <file-name> [force]<br>nv show platform transceiver <transceiver-id> firmware<br>nv action install platform transceiver <transceiver-id> firmware files | |
| Notes | | |

### 3.4.3.8 nv action fetch platform firmware

| | | |
|---|---|---|
| | nv action fetch platform firmware <component-id> <remote-url><br>Fetch remote firmware file to local filesystem for platform components such as ASIC, BIOS, CPLD and transceiver. | |
| Syntax Description | component-id | Platform component name: ASIC, BIOS, CPLD, and transceiver. For system with BMC, more firmware like EROT/FPGA/BMC are supported. |
| | remote-url | • Remote url path to fetch file from.<br>• Format: [protocol]://username[:password]@hostname/path/filename<br>• Supported protocols: SCP, HTTPS, FILE, FTP, and SFTP.<br>• The password must be encoded if it contains special characters and is provided as part of the command. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv action fetch platform firmware ASIC scp://my_user:my_password@hostname/
dir/file.mfa
Fetching file …
File fetched successfully
Action succeeded

admin@nvos:~$ nv action fetch platform firmware transceiver scp://
my_user:my_password@hostname/dir/file.bin
Fetching file …
File fetched successfully
Action succeeded

admin@nvos:~$ nv action fetch platform firmware ASIC file:///dir/file.mfa
Fetching file …
File fetched successfully
Action succeeded
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/platform/firmware/{component-id}/files/{file-name} |
| Related commands | nv show platform firmware <component-id> files<br>nv action rename platform firmware <component-id> files <file-name> <new-name><br>nv action upload platform firmware <component-id> files <file-name> <remote-url><br>nv action delete platform firmware <component-id> files <file-name><br>nv action install platform firmware <component-id> files <file-name> [force]<br>nv show platform transceiver <transceiver-id> firmware<br>nv action install platform transceiver <transceiver-id> firmware files |
| Notes | |

### 3.4.3.9 nv action upload platform firmware files

| | | |
|---|---|---|
| | nv action upload platform firmware <component-id> files <file-name> <remote-url><br>Upload available firmware file for platform components such as ASIC, BIOS, CPLD and transceiver to remote server. | |
| Syntax Description | component-id | Platform component name: ASIC, BIOS, CPLD, and transceiver. For system with BMC, more firmware like EROT/FPGA/BMC are supported. |
| | file-name | Firmware file name |

| | | |
|---|---|---|
| | remote-url | Destination image file name<br>Remote url path to upload a file to.<br>Format: [protocol]://username[:password]@hostname/path/filename<br>Supported protocols: SCP, FTP, SFTP, and HTTPS |
| Default | N/A | |
| History | 25.02.2002<br>25.02.4002 Added HTTPS support in remote-url | |
| Example | `admin@nvos:~$ nv action upload platform firmware ASIC files fw-QTM.mfa new-fw-QTM.mfa`<br><br>`Action executing ...`<br>`File upload successfully`<br>`Action succeeded` | |
| REST API | POST https://<ip>/nvue_v1/platform/firmware/{component-id}/files/{file-name} | |
| Related commands | nv show platform firmware <component-id> files<br>nv action fetch platform firmware <component-id> <url><br>nv action delete platform firmware <component-id> files <file-name><br>nv action install platform firmware <component-id> files <file-name> [force]<br>nv show platform transceiver <transceiver-id> firmware<br>nv action install platform transceiver <transceiver-id> firmware files | |
| Notes | | |

# 4 NVIDIA User Experience (NVUE)

NVUE is an object-oriented, schema driven model of a complete NVOS system (hardware and software) providing a robust API that allows for multiple interfaces to both view (show) and configure (set and unset) any element within a system running the NVUE software.

- NVUE Object Model
- NVUE CLI Overview
- NVUE OpenAPI

## 4.1 NVUE Object Model

The NVUE object model definition uses the OpenAPI specification (OAS). Similar to YANG (RFC 6020 and RFC 7950), OAS is a data definition, manipulation, and modeling language (DML) that lets you build model-driven interfaces for both humans and machines. Although the computer networking and telecommunications industry commonly uses YANG (standardized by IETF) as a DML, the adoption of OpenAPI is broader, spanning cloud to compute to storage to IoT and even social media. The OpenAPI Initiative (OAI) consortium leads OpenAPI standardization, a chartered project under the Linux Foundation.

The OAS schema forms the management plane model with which you configure, monitor, and manage the NVOS switch. The v3.0.2 version of OAS defines the NVUE data model.

Like other systems that use OpenAPI, the NVUE OAS schema defines the endpoints (paths) exposed as RESTful APIs. With these REST APIs, you can perform various create, retrieve, update, delete, and eXecute (CRUDX) operations. The OAS schema also describes the API inputs and outputs (data models).

You can use the NVUE object model in these two ways:

- Through the NVUE REST API, where you run the GET, PATCH, DELETE, and other REST APIs on the NVUE object model endpoints to configure, monitor, and manage the switch. Because of the large user community and maturity of OAS, you can use several popular tools and libraries to create client-side bindings to use the NVUE REST API.
- Through the NVUE CLI, where you configure, monitor and manage the NVOS network elements. The CLI commands translate to their equivalent REST APIs, which NVOS then runs on the NVUE object model.

The CLI and the REST API are equivalent in functionality; you can run all management operations from the REST API or the CLI. The NVUE object model drives both the REST API and the CLI management operations. All operations are consistent; for example, the CLI `nv show` commands reflect any PATCH operation (create) you run through the REST API.

NVUE follows a declarative model, removing context-specific commands and settings. It is structured as a *big tree* that represents the entire state of a NVOS instance. At the base of the tree are high level branches representing objects, such as *system* and *interface*. Under each of these branches are further branches. As you navigate through the tree, you gain a more specific context. At the leaves of the tree are actual attributes, represented as key-value pairs. The path through the tree is similar to a filesystem path.

Please note that configuration with dependencies should be applied in two different steps.

NVOS installs NVUE by default and enables the NVUE service `nvued`.

# 4.2 NVUE CLI Overview


- 4.2.1 Command Syntax
- 4.2.2 Command Completion
- 4.2.3 Command Question Mark
- 4.2.4 Command Abbreviation
- 4.2.5 Command Help
- 4.2.6 Command List
- 4.2.7 Command History
- 4.2.8 Command Ranges
- 4.2.9 Command Categories
  - 4.2.9.1 Configuration Commands
  - 4.2.9.2 Monitoring Commands
  - 4.2.9.3 Action Commands
  - 4.2.9.4 Configuration Management Commands
  - 4.2.9.5 List All NVUE Commands
- 4.2.10 Search for a Specific Configuration
- 4.2.11 Clear Switch Configuration
- 4.2.12 Example Configuration Commands
  - 4.2.12.1 Configure the System Hostname
  - 4.2.12.2 Configure an Interface
- 4.2.13 Example Monitoring Commands
  - 4.2.13.1 Show Installed Software
  - 4.2.13.2 Show Interface Configuration
- 4.2.14 Reset NVUE Configuration to Default Values
- 4.2.15 Add Configuration Apply Messages
- 4.2.16 Configure Auto Save
- 4.2.17 Example Configuration Management Commands
  - 4.2.17.1 Apply and Save a Configuration
  - 4.2.17.2 Detach a Pending Configuration
  - 4.2.17.3 View Differences Between Configurations
  - 4.2.17.4 Replace and Patch a Pending Configuration
- 4.2.18 Passwords and Special Characters


The NVUE CLI has a flat structure as opposed to a modal structure. This means that you can run all commands from the primary prompt instead of only in a specific mode.

## 4.2.1 Command Syntax

NVUE commands all begin with `nv` and fall into one of four syntax categories:

- Configuration (`nv set` and `nv unset`)
- Monitoring (`nv show`)

- Action commands ( `nv action` )
- Configuration management ( `nv config` ).

### 4.2.2 Command Completion

As you enter commands, you can get help with the valid keywords or options using the Tab key. For example, using Tab completion with `nv set` displays the possible options for the command and returns you to the command prompt to complete the command.

```
admin@nvos:~$ nv set <<press Tab>>
acl        interface  platform   system
```

### 4.2.3 Command Question Mark

You can type a question mark ( `?` ) after a command to display required information quickly and concisely. When you type `?` , NVUE specifies the value type, range, and options with a brief description of each; for example:

```
admin@nvos:~$ nv set system config auto-save ?

    [Enter]
    state                  Enable/Disable configuration automatic save feature
```

NVUE also indicates if you need to provide specific values for the command:

```
admin@nvos:~$ nv set interface ?
    <interface-id>         Interface (interface-name)
```

### 4.2.4 Command Abbreviation

NVUE supports command abbreviation, where you can type a certain number of characters instead of a whole command to speed up CLI interaction. For example, instead of typing `nv show interface` , you can type `nv sh int` .

If the command you type is ambiguous, NVUE shows the reason for the ambiguity so that you can correct the shortcut. For example:

```
admin@nvos:~$ nv s i
Ambiguous Command:
   set interface
   show interface
```

### 4.2.5 Command Help

As you enter commands, you can get help with command syntax by entering `-h` or `--help` at various points within a command entry. For example, to examine the options available for `nv set interface` , enter `nv set interface -h` or `nv set interface --help` .

```
admin@nvos:~$ nv set interface -h
```

```
usage:
  nv [options] set interface <interface-id>

Description:
  interface             Update all interfaces. Provide single interface or multiple interfaces using ranging (e.g.
sw1-2p1-2 -> sw1p1,sw1p2,sw2p1,sw2p2).

Identifiers:
  <interface-id>        Interface (interface-name)

General Options:
  -h, --help            Show help.
```

### 4.2.6 Command List

You can list all the NVUE commands by running `nv list-commands`.

### 4.2.7 Command History

At the command prompt, press the Up Arrow and Down Arrow keys to move back and forth through the list of commands you entered. When you find a given command, you can run the command by pressing Enter. Optionally, you can modify the command before you run it.

### 4.2.8 Command Ranges

A single interface or multiple interfaces can be provided using a range such as sw1-2p1-2 -> sw1p1,sw1p2,sw2p1,sw2p2.

Example:

```
admin@nvos:~$ nv set interface sw1p1s1,sw1p1s2 description TEST
admin@nvos:~$  nv config diff
- set:
    interface:
      sw1p1s1-2:
        description: TEST
        type: nvl
```

```
admin@nvos:~$  nv set interface sw1p1-2s1 description TEST
admin@nvos:~$  nv config diff
- set:
    interface:
      sw1p1-2s1,sw2p1-2s1:
        description: TEST
        type: nvl
```

### 4.2.9 Command Categories

The NVUE CLI has a flat structure; however, the commands are in four functional categories:

- Configuration
- Monitoring
- Action
- Configuration Management

#### 4.2.9.1 Configuration Commands

The NVUE configuration commands modify switch configuration. You can set and unset configuration options.

The `nv set` and `nv unset` commands are in the following categories. Each command group includes subcommands. Use command completion (press the Tab key) to list the subcommands.

| Command Group | Description |
|---|---|
| `nv set interface <interface-id>`<br>`nv unset interface <interface-id>` | Configures the switch interfaces. Use this command to configure eth0/eth1/lo/nvl interfaces. |
| `nv set system`<br>`nv unset system` | Configures the hostname of the switch, pre and post login messages, log level, users, password-hardening policies etc. |
| `nv set acl`<br>`nv unset acl` | Configures ACLs. |
| `nv set platform`<br>`nv unset platform` | Configures the platform firmware configuration. |

### 4.2.9.2 Monitoring Commands

The NVUE monitoring commands show various parts of the network configuration. For example, you can show the complete network configuration or only interface configuration. The monitoring commands are in the following categories. Each command group includes subcommands. Use command completion (press the Tab key) to list the subcommands.

| Command Group | Description |
|---|---|
| `nv show acl` | Shows Access Control List configuration. |
| `nv show action` | Shows information about the action commands job. |
| `nv show interface` | Shows interface configuration. |
| `nv show platform` | Shows platform configuration, such as hardware and software components. |
| `nv show system` | Shows global system settings, such as the images, tech-support files and log . You can also see system login messages and switch reboot history. |
| `nv show vrf` | Shows VRF configuration. |
| `nv show ib` | Shows system and MGMT GUIDs and LIDs |

> ⚠ If there are no pending or applied configuration changes, the `nv show` command only shows the running configuration (under operational).

Additional options are available for the `nv show` commands. For example, you can choose the configuration you want to show (pending, applied, startup, or operational). You can also turn on colored output, and paginate specific output.

| Option | Description |
| --- | --- |
| `--applied` | Shows configuration applied with the `nv config apply` command. For example, `nv show interface eth0 --applied` . |
| `--brief-help` | Shows help about the `nv show` command. For example, `nv show interface sw1p1 --brief-help` |
| `--color` | Turns colored output on or off. For example, `nv show interface eth0 --color on` |
| `--help` | Shows `help` for the NVUE commands. |
| `--filter` | Filters show command output on column data. For example, the `nv show interface --filter mtu=256` shows only the interfaces with operational MTU 256.<br>To filter on multiple column outputs, enclose the filter types in parentheses; for example, `nv show interface --filter "type=ib&mtu=256"` shows data for ib interfaces with MTU 256.<br>You can use wildcards; for example, `nv show interface swp1 --filter "link.speed=200*"` shows all interfaces that have speed start with `200` .<br>You can filter on all revisions (operational, applied, and pending); for example, `nv show interface --filter "ip.address=1*" --rev=applied` shows all IP addresses that start with `1` for in the applied revision. |
| `--hostname` | Shows system configuration for the switch with the specified hostname. For example, `nv show --hostname leaf01`. |
| `--operational` | Shows the running configuration (the actual system state). For example, `nv show interface eth0 --operational` shows the running configuration for eth0. The running and applied configuration should be the same. If different, inspect the logs. |
| `--output` | Shows command output in table format (auto), `json` format or `yaml` format. For example:<br>`nv show interface eth0 --output auto`<br>`nv show interface eth0 --output json`<br>`nv show interface eth0 --output yaml` |
| `--paginate` | Paginates the output. For example, `nv show interface eth0 --paginate on` . |
| `--pending` | Shows configuration that is `set` and `unset` but not yet applied or saved. For example, `nv show  interface eth0 --pending`. |
| `--rev <revision>` | Shows a detached pending configuration. See the `nv config detach` configuration management command below. For example, `nv show interface eth0 --rev changeset/admin/2021-06-11_16.16.41_FPKK`. |
| `--startup` | Shows configuration saved with the `nv config save` command. This is the configuration after the switch boots. |
| `--tab` | Show information in tab format. For example, `nv show interface sw1p1 --tab.` |
| `--view` | Shows different views. A view is a subset of information provided by certain `nv show` commands. To see the views available for an `nv show` command, run the command with `--view` and press TAB. |

### 4.2.9.3 Action Commands

The NVUE action commands run immediate change in the switch.

The `nv action` command is in the following categories. Each command group includes subcommands. Use command completion (Tab key) to list the subcommands.

| Command Group | Description |
|---|---|
| `nv action <action> system` | Run some actions on the switch. managing the software image, reboot the system ,generate tech-support etc. |
| `nv action <action> interface` | Run some actions on the switch. Clear counters, renew the DHCP-client on eth0 etc. |
| `nv action <action> platform` | Run some actions on the platform. turn-on or turn-off the UID led etc. |

### 4.2.9.4 Configuration Management Commands

The NVUE configuration management commands manage and apply configurations.

| Command | Description |
|---|---|
| `nv config apply` | Applies the pending configuration ( `nv config apply` ) or a specific revision ( `nv config apply 2` ) to become the applied configuration. To see the list of revisions you can apply, run `nv config apply <<Tab>>` .<br>You can also use these prompt options:<br>• `--y` or `--assume-yes` to automatically reply `yes` to all prompts.<br>• `--assume-no` to automatically reply `no` to all prompts.<br>⚠ NVOS applies but does not save the configuration; the configuration does not persist after a reboot.<br>You can also use these apply options:<br>`--confirm` applies the configuration change but you must confirm the applied configuration. If you do not confirm within ten minutes, the configuration rolls back automatically. You can change the default time with the apply `--confirm <time>` command. For example, `apply --confirm 60` requires you to confirm within one hour.<br>`--confirm-status` shows the amount of time left before the automatic rollback.<br>To save the pending configuration to the startup configuration automatically when you run `nv config apply` so that you do not have to run the `nv config save` command, enable auto save. |
| `nv config detach` | Detaches the configuration from the current pending configuration. NVOS names the detached configuration `pending` and includes a timestamp with extra characters. For example: `pending_20210128_212626_4WSY`<br>To list all the current detached pending configurations, run `nv config diff <<press tab>` . |

| Command | Description |
|---|---|
| `nv config diff <revision> <revision>` | Shows differences between configurations, such as the pending configuration and the applied configuration or the detached configuration and the pending configuration. |
| `nv config find <string>` | Finds a portion of the applied configuration according to the search string you provide. For example to find swp1 in the applied configuration, run `nv config find sw1p1`. |
| `nv config history` | Enables you to keep track of the configuration changes on the switch and shows a table with the configuration revision ID, the date and time of the change, the user account that made the change, and the type of change (such as CLI or REST API). The `nv config history <revision>` command shows the apply history for a specific revision. |
| `nv config patch <nvue-file>` | Updates the pending configuration with the specified YAML configuration file. |
| `nv config replace <nvue-file>` | Replaces the pending configuration with the specified YAML configuration file. |
| `nv config revision` | Shows all the configuration revisions on the switch. |
| `nv config save` | Overwrites the startup configuration with the applied configuration by writing to the `/etc/nvue.d/startup.yaml` file. The configuration persists after a reboot. |
| `nv config show` | Shows the currently applied configuration in `yaml` format. This command also shows NVUE version information. |
| `nv config show -o commands` | Shows the currently applied configuration commands. |
| `nv config diff -o commands` | Shows differences between two configuration revisions. |

### 4.2.9.5 List All NVUE Commands

To show the full list of NVUE commands, run `nv list-commands`. For example:

```
admin@nvos:~$ nv list-commands
nv show platform environment
nv show platform environment fan
nv show platform environment fan <fan-id>
nv show platform environment temperature
nv show platform environment temperature <sensor-id>
nv show platform environment psu
nv show platform environment psu <psu-id>
nv show platform environment led
nv show platform environment led <led-id>
nv show platform software
nv show platform software installed
nv show platform software installed <installed-id>
...
```

You can show the list of commands for a command grouping. For example, to show the list of system commands:

```
admin@nvos:~$ nv list-commands system
nv show system
nv show system message
nv show system log
nv show system log file
nv show system log file <file-name>
nv show system log file list
nv show system log file follow
nv show system log component
nv show system log component <component-name>
nv show system log component <component-name> file
nv show system log component <component-name> file list
nv show system log component <component-name> file follow
nv show system log component <component-name> file <file-name>
nv show system reboot
nv show system reboot reason
...
```

Use the Tab key to get help for the command lists you want to see. For example, to show the list of command options available for the interface eth0, run:

```
admin@nvos:~$ nv list-commands interface eth0 <<press Tab>>
ip      link    pluggable
```

## 4.2.10 Search for a Specific Configuration

To search for a specific portion of the NVUE configuration, run the `nv config find <search string>` command. The search shows all items above and below the search string. For example, to search the entire NVUE object model configuration for any mention of `ptm`:

```
admin@nvos:~$ nv config find system
 - set:
    system:
      aaa:
        authentication:
          restrictions:
            fail-delay: 0
            lockout-state: disabled
        user:
          admin:
            password: '*'
      timezone: Asia/Jerusalem
```

## 4.2.11 Clear Switch Configuration

To reset the configuration on the switch back to the factory defaults, run the following command:

```
admin@nvos:~$ nv config apply empty
```

## 4.2.12 Example Configuration Commands

This section provides examples of how to configure a NVOS switch using NVUE commands.

### 4.2.12.1 Configure the System Hostname

The example below shows the NVUE commands required to change the hostname for the switch to nvos:

```
admin@nvos:~$ nv set system hostname nvos
```

```
admin@nvos:~$ nv config apply
```

### 4.2.12.2 Configure an Interface

The example below shows the NVUE commands required to bring up sw1p1.

```
admin@nvos:~$ nv set interface sw1p1s1 link state up
admin@nvos:~$ nv config apply
```

## 4.2.13 Example Monitoring Commands

This section provides monitoring command examples.

### 4.2.13.1 Show Installed Software

The following example command lists the software installed on the switch:

```
admin@nvos:~$ nv show platform software installed
Installed software                        description
package                                   version
----------------------------------------
------------------------------------------------------------------------------------------
----------------------------------------  ------------------------------
acl                                       access control list - utilities
acl                                       2.2.53-10
adduser                                   add and remove users and groups
adduser                                   3.118
apparmor                                  user-space parser utility for AppArmor
apparmor                                  2.13.6-10
apt                                       commandline package manager
apt                                       2.2.4
apt-transport-https                       transitional package for https support
apt-transport-https                       2.2.4
audisp-tacplus                            audisp module for TACACS+ accounting
audisp-tacplus                            1.0.2
auditd                                    User space tools for security auditing
auditd                                    1:3.0-2
base-files                                Debian base system miscellaneous files
base-files                                11.1+deb11u3
base-passwd                               Debian base system master password and group files
base-passwd                               3.5.51
bash                                      GNU Bourne Again SHell
bash                                      5.1-2+b3
bash-completion                           programmable completion for the bash shell
bash-completion                           1:2.11-2
bash-tacplus                              Bash TACACS+ plugin for per-command TACACS+ authorization.
bash-tacplus                              1.0.0
bridge-utils                              Utilities for configuring the Linux Ethernet bridge
bridge-utils                              1.7-1
bsdextrautils                             extra utilities from 4.4BSD-Lite
bsdextrautils                             2.36.1-8+deb11u1
bsdmainutils                              Transitional package for more utilities from FreeBSD
bsdmainutils                              12.1.7+nmu3
bsdutils                                  basic utilities from 4.4BSD-Lite
bsdutils                                  1:2.36.1-8+deb11u1
busybox                                   Tiny utilities for small and embedded systems
busybox                                   1:1.30.1-6+b3
ca-certificates                           Common CA certificates
ca-certificates                           20210119
...
```

### 4.2.13.2 Show Interface Configuration

The following example command shows the running, applied, and pending sw1p1s1 interface configuration.

```
admin@nvos::~$ nv show interface sw1p1s1
                    operational          applied
--------------------  -------------------  --------
```

```
link
  auto-negotiate      on                    on
  duplex                                    full
  speed                                     auto
  counters
    in-bytes          0 Bytes
    in-pkts           0
    in-drops          0
    in-errors         0
    out-bytes         0 Bytes
    out-pkts          0
    out-drops         0
    out-errors        0
    in-symbol-errors  0
    out-wait          0
  [diagnostics]
  mtu                                       4096
  op-vls                                    VL0-VL7
  lanes                                     1X,2X,4X
  state               down                  up
  supported-speed     800G
  max-supported-mtu   4096
  physical-state      Polling
  logical-state       Down
  supported-lanes     1X,2X,4X
  vl-capabilities     VL0-VL7
 type                 nvl                   nvl
```

## 4.2.14 Reset NVUE Configuration to Default Values

To reset the NVUE configuration on the switch back to the default values, run the following command:

```
admin@nvos:~$ nv config replace /usr/lib/python3/dist-packages/cue_config_v1/initial.yaml
admin@nvos:~$ nv config apply
```

## 4.2.15 Add Configuration Apply Messages

When you run the `nv config apply` command, you can add a message that describes the configuration updates you make. You can see the message when you run the `nv config history` c ommand.

To add a configuration apply message, run the `nv config apply -m <message>` command. If the message includes more than one word, enclose the message in quotes.

```
admin@nvos:~$ nv config apply -m "this is my message"
```

## 4.2.16 Configure Auto Save

By default, when you run the `nv config apply` command to apply a configuration setting, NVUE applies the pending configuration to become the applied configuration and automatically saves the changes to the startup configuration file ( `/etc/nvue.d/startup.yaml` ).

To disable auto save so that NVUE does not save applied configuration changes, run the `nv set system config auto-save enable off` command:

```
admin@nvos:~$ nv set system config auto-save enable off
admin@nvos:~$ nv config apply
```

When you disable auto save, you must run the `nv config save` command to save the applied configuration to the startup configuration so that the changes persist after a reboot.

## 4.2.17 Example Configuration Management Commands

This section provides examples of how to use the configuration management commands to apply, save, and detach configurations.

### 4.2.17.1 Apply and Save a Configuration

The following example command configures the front panel port interfaces sw1p1 state. The configuration is only in a pending configuration state. The configuration is not applied. NVUE has not yet made any changes to the running configuration.

```
admin@nvos:~$ nv set interface sw1p1s1 link state down
```

To apply the pending configuration to the running configuration, run the `nv config apply` command. The configuration does not persist after a reboot.

```
admin@nvos:~$ nv config apply
```

To save the applied configuration to the startup configuration, run the `nv config save` command. The configuration persists after a reboot.

```
admin@nvos:~$ nv config save
```

### 4.2.17.2 Detach a Pending Configuration

The following example configures the IP address of the eth0 interface, then detaches the configuration from the current pending configuration. NVOS saves the detached configuration to a file with a numerical value to distinguish it from other pending configurations.

```
admin@nvos:~$ nv set interface eth0 ip address 10.10.10.1
admin@nvos:~$ nv config detach
```

### 4.2.17.3 View Differences Between Configurations

To view differences between configurations, run the `nv config diff` command.

To view differences between two detached pending configurations, run the `nv config diff` «TAB» command to list all the current detached pending configurations, then run the `nv config diff` command with the pending configurations you want to diff:

```
admin@nvos:~$ nv config diff <<press Tab>>
1        2        3        4        5        6        applied  empty    startup
admin@nvos:~$ nv config diff 1 2
```

```
- set:
    system:
      security:
        password-hardening:
          state: disabled
```

To view differences between the applied configuration and the startup configuration:

```
admin@nvos:~$ nv config diff applied startup
```

### 4.2.17.4 Replace and Patch a Pending Configuration

The following example replaces the pending configuration with the contents of the YAML configuration file called `nv-02/13/2021.yaml` located in the `/deps` directory:

```
admin@nvos:~$ nv config replace /deps/nv-02/13/2021.yaml
```

The following example patches the pending configuration (runs the set or unset commands from the configuration in the `nv-02/13/2021.yaml` file located in the `/deps` directory):

```
admin@nvos:~$ nv config patch /deps/nv-02/13/2021.yaml
```

## 4.2.18 Passwords and Special Characters

If you use certain special characters in a password, you must quote or escape (with a backslash) these characters so that the system understands that they are part of the password.

The following table shows if you need to quote or escape a special character.

- Normal Use indicates that you can use the special character without quotes or a backslash.
- Single Quotes and Double Quotes indicate that the entire password needs to be enclosed in quotes.

| Special Character | Normal Use | Single Quotes (') | Double Quotes ("") | Escape ( \ ) |
|---|---|---|---|---|
| backtick (`) | x | ✓ | 1 | ✓ |
| exclamation point ( ! ) | x | ✓ | x | ✓ |
| semicolon ( ; ) | x | ✓ | ✓ | ✓ |
| ampersand ( & ) | x | ✓ | ✓ | ✓ |
| question mark ( ? ) | x | ✓ | ✓ | x |
| tilde (~) | x | ✓ | ✓ | ✓ |
| at-sign ( @ ) | ✓ | ✓ | ✓ | ✓ |
| hash sign ( # ) | x | ✓ | ✓ | ✓ |
| dollar sign ( $ ) | x | ✓ | x | ✓ |

| Special Character | Normal Use | Single Quotes (') | Double Quotes ("") | Escape ( \ ) |
|---|---|---|---|---|
| percent sign ( % ) | ✓ | ✓ | ✓ | ✓ |
| caret ( ^ ) | ✓ | ✓ | ✓ | ✓ |
| asterisk ( * ) | ✓ | ✓ | ✓ | ✓ |
| parentheses ( () ) | x | ✓ | ✓ | ✓ |
| dash ( - ) | ✓ | ✓ | ✓ | ✓ |
| underscore ( _ ) | ✓ | ✓ | ✓ | ✓ |
| equals sign ( = ) | ✓ | ✓ | ✓ | ✓ |
| plus sign ( + ) | ✓ | ✓ | ✓ | ✓ |
| vertical bar | x | ✓ | ✓ | ✓ |
| brackets ( [] ) | ✓ | ✓ | ✓ | ✓ |
| braces ( {} ) | ✓ | ✓ | ✓ | ✓ |
| colon ( : ) | ✓ | ✓ | ✓ | ✓ |
| single quote ( ‘ ) | x | x | ✓ | ✓ |
| double quote ( “ ) | x | ✓ | x | ✓ |
| comma ( , ) | ✓ | ✓ | ✓ | ✓ |
| angle brackets ( <> ) | x | ✓ | ✓ | ✓ |
| slash ( / ) | ✓ | ✓ | ✓ | ✓ |
| dot ( . ) | 2 | 2 | 2 | 2 |
| white space | x | x | 3 | x |

1. Requires escape ( \ ) in addition to the double quotes ( "" ).
2. You cannot use this character at the beginning of a word.
3. A word cannot consist entirely of white space, even inside double quotes.

The following example shows a password that includes a question mark (?):

```
nvos@admin:~$ nv set system aaa user nvos password “Hello?world123”
```

The following example shows a password that includes a dot (.):

```
nvos@admin:~$ nv set system aaa user nvos password “Hello.world.123”
```

The following example shows a password that includes a dot (.) and tilde (~):

```
nvos@admin:~$ nv set system aaa user nvos password “Hello.world\~123”
```

You might need to encode special characters in a password, for example in a URL. The following table shows the special character encoding.

- ✓ indicates that encoding is not needed.
- `%xx` indicates that you need to replace the special character with `%xx`.

| Symbol | Normal | Single Quotes (') | Double Quotes ("") | Escape ( \ ) |
|---|---|---|---|---|
| backtick (`) | %60 | ✓ | %60 | ✓ |
| exclamation point ( ! ) | %21 | ✓ | %21 | ✓ |
| semicolon ( ; ) | %3B | ✓ | ✓ | ✓ |
| ampersand ( & ) | %26 | ✓ | ✓ | ✓ |
| question mark ( ? ) | %3F | %3F | %3F | %3F |
| tilde (~) | ✓ | ✓ | ✓ | ✓ |
| at-sign ( @ ) | ✓ | ✓ | ✓ | ✓ |
| hash sign ( # ) | %23 | %23 | %23 | %23 |
| dollar sign ( $ ) | %24 | ✓ | %24 | ✓ |
| percent sign ( % ) | ✓ | ✓ | ✓ | ✓ |
| caret ( ^ ) | ✓ | ✓ | ✓ | ✓ |
| asterisk ( * ) | ✓ | ✓ | ✓ | ✓ |
| left parenthesis ( ( ) | %28 | ✓ | ✓ | ✓ |
| right parenthesis ( ) ) | %29 | ✓ | ✓ | ✓ |
| dash ( - ) | ✓ | ✓ | ✓ | ✓ |
| underscore ( _ ) | ✓ | ✓ | ✓ | ✓ |
| equals sign ( = ) | ✓ | ✓ | ✓ | ✓ |
| plus sign ( + ) | ✓ | ✓ | ✓ | ✓ |
| vertical bar | %7C | ✓ | ✓ | ✓ |
| left bracket ( [ ) | %5B | %5B | %5B | %5B |
| right bracket ( ] ) | %5D | %5D | %5D | %5D |
| braces ( {} ) | ✓ | ✓ | ✓ | ✓ |
| colon ( : ) | ✓ | ✓ | ✓ | ✓ |
| single quote ( ‘ ) | %27 | %27 | ✓ | ✓ |
| double quote ( “ ) | %22 | ✓ | %22 | ✓ |
| comma ( , ) | ✓ | ✓ | ✓ | ✓ |
| left angle bracket ( < ) | %3C | ✓ | ✓ | ✓ |
| right angle bracket ( > ) | %3E | ✓ | ✓ | ✓ |

| Symbol | Normal | Single Quotes (') | Double Quotes ("") | Escape ( \ ) |
|---|---|---|---|---|
| slash ( / ) | %2F | %2F | %2F | %2F |
| dot ( . ) | ✓ | ✓ | ✓ | ✓ |
| white space | %20 | ✓ | ✓ | ✓ |

The following example fetches an image stored on a device with IP address 10.0.1.251 using the password `Pass#pass1` for user1:

```
nvos@admin:~$ nv action fetch system image scp://user1:Pass1%23pass1@10.0.1.251/host/nos-images/nvos-amd64-25.02.1857.bin
```

# 4.3 NVUE OpenAPI


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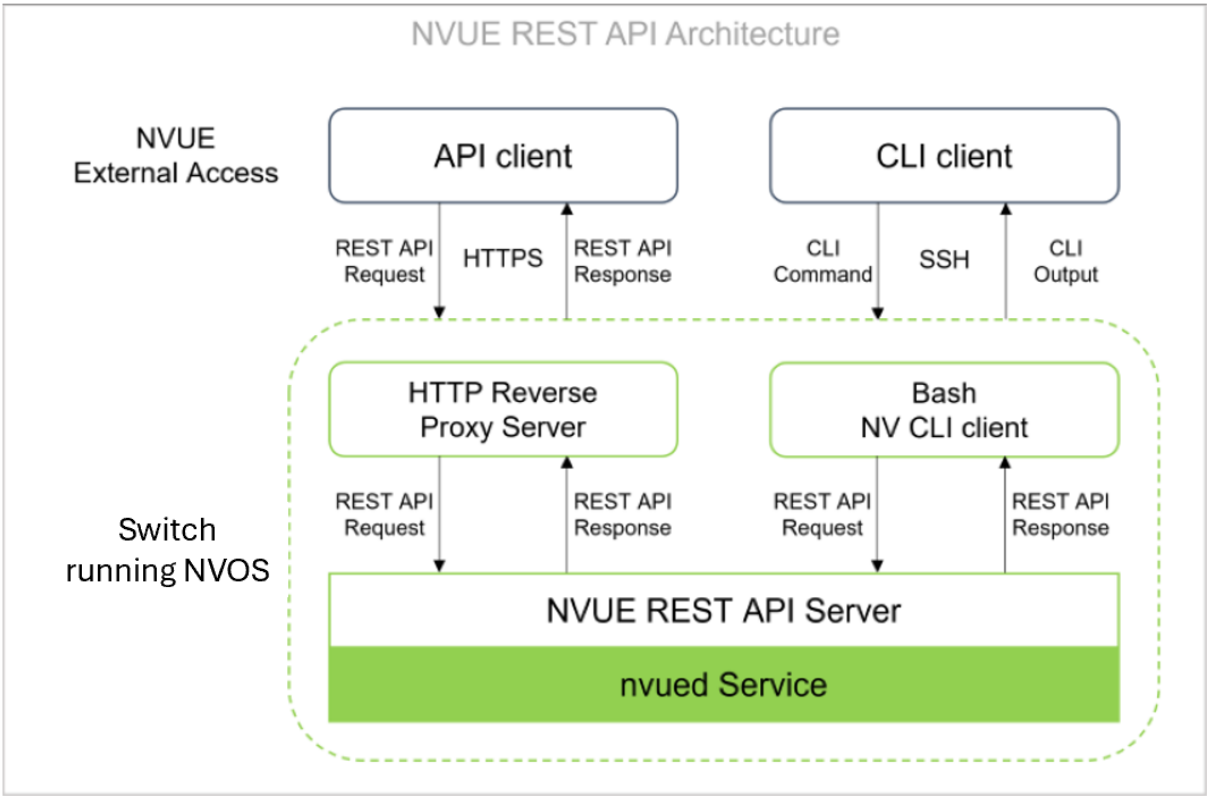
This section provides information about using the NVUE API.

In addition to the CLI, NVUE supports a REST API. Instead of accessing NVOS using SSH, you can interact with the switch using an HTTP client, such as cURL or a web browser.

The `nued` service provides access to the NVUE REST API. NVOS exposes the HTTP endpoint internally, which makes the NVUE REST API accessible locally within the NVOS switch. The NVUE CLI also communicates with the `nvued` service using internal APIs. To provide external access to the NVUE REST API, NVOS uses an HTTP reverse proxy server, and supports HTTPS and TLS connections from external REST API clients.

The following illustration shows the NVUE REST API architecture and illustrates how NVOS forwards the requests internally.




## 4.3.1 Supported HTTP Methods

The NVUE REST API supports the following methods:

- The GET method displays configuration and operational data, and is equivalent to the `nv show` commands.
- The POST method creates and submits operations. You typically use this method for `nv action` commands and for the `nv config` command to create revisions.
- The PATCH method replaces or unsets a configuration. You use this method for the `nv set` and `nv config apply` commands. You can either perform:
    - A *targeted* configuration patch to make a configuration change, where you run a specific NVUE REST API targeted at a particular OpenAPI end-point URI. Based on the NVUE schema definition, you need to direct the PATCH REST API request at a particular endpoint (for example, `/nvue_v1/interface/<interface-id>/link/mtu`) and provide the payload that conforms to the schema. With a targeted configuration patch, you can control individual resources.
    - A *root* patch, where you run the NVUE PATCH API on the root node of the schema so that a single PATCH operation can change one, some, or the entire configuration in a single payload. The payload of the PATCH method must be aware of the entire NVUE object model schema because you make the configuration changes relative to the root node `/nvue_v1`. You typically perform a *root patch* to push all configurations to the switch in bulk; for example, if you use an SDN controller or a network management system to push the entire switch configuration every time you need to make a change, regardless of how small or large. A root patch can also make configuration changes with fewer round trips to the switch.
    - The input payload in a PATCH request can have either a `set` or `unset` json object for the same resource, but not both. The order in which the API executes the `set` and `unset` objects is not deterministic and not supported.
- The DELETE method deletes a configuration and is equivalent to the `nv unset` commands.

## 4.3.2 Secure the API

The NVUE REST API supports HTTP basic authentication, and the same underlying authentication methods for username and password that the NVUE CLI supports. User accounts work the same on both the API and the CLI.

### 4.3.2.1 Certificates

NVOS includes a self-signed certificate and private key to use on the server so that it works out of the box. The switch generates the self-signed certificate and private key when it boots for the first time. The X.509 certificate with the public key is in `/etc/ssl/certs/nvue.pem` and the corresponding private key is in `/etc/ssl/private/nvue.key`.

NVIDIA recommends you use your own certificates and keys. For the steps to generate self-signed certificates and keys, refer to the Ubuntu Certificates and Security documentation.

NVOS lets you manage CA certificates (such as DigiCert or Verisign) and entity (end-point) certificates. Both a CA certificate and an entity certificate can contain a chain of certificates.

You can import certificates onto the switch (fetch certificates from an external source), set which certificate you want to use for the NVUE REST API, and show information about a certificate, such as the serial number, and the date and time during which the certificate is valid.

#### 4.3.2.1.1 Import a Certificate

- You can import a maximum of 25 entity certificates and a maximum of 25 CA certificates.
- The certificate you import contains sensitive private key information. NVIDIA recommends that you use a secure transport such as SFTP, SCP, or HTTPS.

- To import an entity certificate, run an `nv action import system security certificate <cert-id>` command.
- To import a CA certificate, run an `nv action import system security ca-certificate <cert-id>` command.

If the certificate is passphrase protected, you need to include the passphrase.

You must provide a certificate ID ( `<cert-id>` ) to uniquely identify the certificate you import.

The following example imports a CA certificate with a public key and calls the certificate `tls-cert-1` . The certificate is passphrase protected with `mypassphrase` . The public key is a Base64 ASCII encoded PEM string.

```
nvos@switch:~$ nv action import system security ca-certificate tls-cert-1 passphrase mypassphrase data "<public-
key>"
```

The following example imports an entity certificate bundle and calls the certificate `tls-cert-1` . The certificate bundle is passphrase protected with `mypassphrase` .

A certificate bundle must be in .PFX or .P12 format.

```
nvos@switch:~$ nv action import system security certificate tls-cert-1 passphrase mypassphrase uri-bundle scp://
user@pass:1.2.3.4:/opt/certs/cert.p12
```

The following example imports an entity certificate with the public key URI `scp://user@pass:1.2.3.4` and private key URI `scp://user@pass:1.2.3.4` , and calls the certificate `tls-cert-1` . The certificate is not passphrase protected.

A CA certificate must be in .pem, .p7a, or .p7c format.

```
nvos@switch:~$ nv action import system security certificate tls-cert-1 uri-public-key scp://user@pass:1.2.3.4 uri-
private-key scp://user@pass:1.2.3.4
```

#### 4.3.2.1.2 Set the Certificate to Use

You can configure the NVUE REST API to use a specific certificate.

The following example configures the API to use the certificate `tls-cert-1` :

```
nvos@switch:~$ nv set system api certificate tls-cert-1
nvos@switch:~$ nv config apply
```

The following example configures the API to use the self-signed certificate:

```
nvos@switch:~$ nv set system api certificate self-signed
nvos@switch:~$ nv config apply
```

To unset the certificate to use with the NVUE REST API:

```
nvos@switch:~$ nv unset system api certificate tls-cert-1
```

#### 4.3.2.1.3 Delete Certificates

- To delete an entity certificate and the key data stored on the switch, run the `nv action delete system security certificate <cert-id>` command.
- To delete a CA certificate and the key data stored on the switch, run the `nv action delete system security ca-certificate <cert-id>` command.

The following command deletes the certificate `tls-cert-1`:

```
nvos@switch:~$ nv action delete system security certificate tls-cert-1
```

#### 4.3.2.1.4 Show Certificate Information

- To show all the entity certificates on the switch, run the `nv show system security certificate` command.
- To show all the CA certificates on the switch, run the `nv show system security ca-certificate` command.

The following example shows all the entity certificates on the switch:

```
nvos@switch:~$ nv show system security certificate
```

- To show the applications that are using a specific entity certificate, run the `nv show system security certificate <cert-id> installed` command.
- To show the applications that are using a specific CA certificate, run the `nv show system security ca-certificate <cert-id> installed` command.

The following example shows the applications that are using a specific entity certificate.

```
nvos@switch:~$ nv show system security certificate tls-cert-1 installed
```

- To show detailed information about a specific entity certificate, run the `nv show system security certificate <cert-id> dump` command.
- To show detailed information about a specific CA certificate, run the `nv show system security ca-certificate <cert-id> dump` command.

The following example shows detailed information about the CA certificate `tls-cert-1`:

```
nvos@switch:~$ nv show system security ca-certificate tls-cert-1 dump
```

#### 4.3.2.2 Control Plane ACLs

You can secure the API by configuring:

- A listening address; see API Port and Listening Address below.
- Control plane ACLs; see the following example.

This example shows how to create ACLs to allow users from the management subnet and the local switch to communicate with the switch using REST APIs, and restrict all other access.

```
nvos@switch:~$ nv set acl API-PROTECT type ipv4
nvos@switch:~$ nv set acl API-PROTECT rule 10 action permit
nvos@switch:~$ nv set acl API-PROTECT rule 10 match ip .protocol tcp .dest-port 443 .source-ip 192.168.200.0/24
nvos@switch:~$ nv set acl API-PROTECT rule 10 remark "Allow the Management Subnet to talk to API"
nvos@switch:~$ nv set acl API-PROTECT rule 20 action permit
nvos@switch:~$ nv set acl API-PROTECT rule 20 match ip .protocol tcp .dest-port 443 .source-ip 127.0.0.1
nvos@switch:~$ nv set acl API-PROTECT rule 20 remark "Allow the local switch to talk to the API"
nvos@switch:~$ nv set acl API-PROTECT rule 30 action deny
nvos@switch:~$ nv set acl API-PROTECT rule 30 match ip .protocol tcp .dest-port 443
nvos@switch:~$ nv set acl API-PROTECT rule 30 remark "Block everyone else from talking to the API"
nvos@switch:~$ nv set system control-plane acl API-PROTECT inbound
```

### 4.3.3 Supported Objects

The NVUE object model supports most features on the NVOS switch. The following list shows the supported objects. The NVUE API supports more objects within each of these objects. You can find a full listing of the supported API endpoints here.

| High-level Objects | Description |
|---|---|
| acl | Access control lists. |
| interface | Interface configuration. |
| platform | Platform configuration, such as hardware and software components. |
| system | Global system settings, such as system login messages, switch reboot history, syslog, ntp etc.. |
| vrf | Get VRF. |
| ib | IB Devices. |

### 4.3.4 Use the API

The NVUE CLI and the REST API are equivalent in functionality; you can run all management operations from the REST API or from the CLI. The NVUE object model drives both the REST API and the CLI management operations. All operations are consistent; for example, the CLI `nv show commands` reflect any PATCH operation (create and update) you run through the REST API.

NVUE follows a declarative model, removing context-specific commands and settings. The structure of NVUE is like a big tree that represents the entire state of a NVOS instance. At the base of the tree are high level branches representing objects, such as system and interface. Under each of these branches are more branches. As you navigate through the tree, you gain a more specific

context. At the leaves of the tree are actual attributes, represented as key-value pairs. The path through the tree is similar to a filesystem path.

NVOS enables the NVUE REST API by default. To disable the NVUE REST API, run the `nv set system api state disabled` command.

> ⚠ To use the NVUE REST API in NVOS, you must change the password for the admin user; otherwise you see 401 responses when you run commands.

### 4.3.4.1 API Port and Listening Address

This section shows how to:

- Set the NVUE REST API port. If you do not set a port, NVOS uses the default port 443.
- Specify the NVUE REST API listening address; you can specify an IPv4 address, IPv6 address, or `localhost`. If you do not specify a listening address, NGINX listens on all addresses for the target port.

NVUE Commands

The following example sets the port to 8888:

```
nvos@switch:~$ nv set system api port 8888
nvos@switch:~$ nv config apply
```

You can listen on multiple interfaces by specifying different listening addresses:

```
nvos@switch:~$ nv set system api listening-address 10.10.10.1
nvos@switch:~$ nv set system api listening-address 10.10.20.1
nvos@switch:~$ nv config apply
```

The following example configures the listening address on eth0, which has IP address 172.0.24.0 and uses the management VRF by default:

```
nvos@switch:~$ nv set system api listening-address 172.0.24.0
nvos@switch:~$ nv config apply
```

#### 4.3.4.1.1 Curl Command

The following example sets the port to 8888:

```
nvos@switch:~$ curl -u 'admin:****' -k --request PATCH https://localhost:443/nvue_v1/system/api?rev=2 -H 'Content-
Type:application/json' -d '{"port": 8888 }'
```

You can listen on multiple interfaces by specifying different listening addresses. The following example sets localhost, interface address 10.10.10.1, and 10.10.20.1 as listen-addresses.

```
nvos@switch:~$ curl -u 'admin:****' -k --request PATCH https://localhost:443/nvue_v1/system/api/listening-address?
rev=2 -H 'Content-Type:application/json' -d '{ "localhost": {}, "10.10.10.1": {}, "10.10.20.1": {}}'
```

The following example configures the listening address on eth0, which has IP address 172.0.24.0 and uses the management VRF by default:

```
nvos@switch:~$ curl -u 'admin:****' -k --request PATCH https://localhost:443/nvue_v1/system/api/listening-address?
rev=2 -H 'Content-Type:application/json' -d '{"172.0.24.0": {}}'
```

### 4.3.4.2 Show NVUE REST API Information

To show REST API port configuration, state (enabled or disabled), certificate, listening address, and connection information:

NVUE Commands

Run the `nv show system api` command:

```
nvos@switch:~$ nv show system api
                    operational  applied
------------------  -----------  -----------
state               enabled      enabled
port                443          443
certificate         self-signed  self-signed
[listening-address] any
connections
  active            1
  accepted          2
  handled           2
  requests          2
  reading           0
  writing           1
  waiting           0
```

To show connection information only, run the `nv show system api connections` command:

```
 nvos@switch:~$ nv show system api connections
          operational
--------  -----------
active    2
accepted  8
handled   8
requests  8
reading   0
writing   2
waiting   0
```

To show the configured listening address, run the `nv show system api listening-address` com mand:

```
nvos@switch:~$ nv show system api listening-address
---------
localhost
```

To show all the certificates installed on the switch, run the `nv show system security certificate` command. To show information about a specific certificate, such as the serial number and how long the certificate is valid, run the `nv show system security certificate <certificate>` command:

```
 nvos@switch:~$ nv show system security certificate tls-cert-1
              operational                applied
-------------  -------------------------  -------
installed
 app           TLS
serial-number  67:03:3B:B4:6E:35:D3
valid-from     2023-02-14T00:35:18+00:00
valid-to       2033-02-11T00:35:18+00:00
```

Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -k --request GET https://localhost:443/nvue_v1/system/api?rev=2 -H "accept:
application/json"
{
  "certificate": "self-signed",
  "listening-address": {
    "10.10.10.1": {},
    "10.10.20.1": {},
    "172.0.24.0": {},
    "localhost": {}
  },
  "port": 8888,
  "state": "enabled"
}
```

To show the configured listening address:

```
nvos@switch:~$ curl -u 'admin:****' -k --request GET https://localhost:443/nvue_v1/system/api/listening-address?
rev=2 -H "accept: application/json"
{
  "10.10.10.1": {},
  "10.10.20.1": {}
}
```

To show the certificates on the switch:

```
nvos@switch:~$ curl -u 'admin:****' -k --request GET https://localhost:443/nvue_v1/system/api/certificate?rev=2 -H
"accept: application/json"
{
  "tls-cert-1": {},
  "tls-cert-2": {}
}
```

To show information about a specific certificate, such as the serial number and how long the certificate is valid:

```
nvos@switch:~$ curl -u 'admin:****' -k --request GET https://localhost:443/nvue_v1/system/api/certificate/tls-
cert-1?rev=2 -H "accept: application/json"
{
  "serial-number": "67:03:3B:B4:6E:35:D3",
  "valid-from": "2023-02-14T00:35:18+00:00",
  "valid-to": "2033-02-11T00:35:18+00:00"
}
```

### 4.3.4.3 Run cURL Commands

You can run the cURL commands from the command line. Use the username and password for the switch. For example:

```
nvos@switch:~$ curl  -u 'admin:****' --insecure https://127.0.0.1:443/nvue_v1/interface
{
  "eth0": {
    "ip": {
      "address": {
        "192.168.200.12/24": {}
      }
    },
    "link": {
      "mtu": 1500,
      "state": {
        "up": {}
      },
      "stats": {
        "carrier-transitions": 2,
        "in-bytes": 184151,
        "in-drops": 0,
        "in-errors": 0,
        "in-pkts": 2371,
        "out-bytes": 117506,
        "out-drops": 0,
        "out-errors": 0,
        "out-pkts": 762
      }
...
```

## 4.3.5 API Use Cases

The following examples show the primary API uses cases.

### 4.3.5.1 View a Configuration

Use the following example to obtain the current applied configuration on the switch. Change the `rev` argument to view any revision. Possible options for the `rev` argument include `startup`, `pending`, `operational`, and `applied`.

Curl Command

```
nvos@switch:~$ curl -k -u 'admin:****' -X GET "https://127.0.0.1:443/nvue_v1/?rev=applied&filled=false"
  "interface": {
    "eth0": {
      "acl": {
        "ACL_MGMT_INBOUND_CP_DEFAULT": {
          "inbound": {
            "control-plane": {}
          }
        },
        "ACL_MGMT_INBOUND_CP_DEFAULT_IPV6": {
          "inbound": {
            "control-plane": {}
          }
        },
        "ACL_MGMT_INBOUND_DEFAULT": {
          "inbound": {}
        },
        "ACL_MGMT_INBOUND_DEFAULT_IPV6": {
          "inbound": {}
        },
        "ACL_MGMT_OUTBOUND_CP_DEFAULT": {
          "outbound": {
            "control-plane": {}
          }
        },
        "ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6": {
          "outbound": {
            "control-plane": {}
          }
        }
      },
      "type": "eth"
    },
 ...
```

Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

if __name__ == "__main__":
    r = requests.get(url=nvue_end_point + "/?rev=applied&filled=false",
                     auth=auth,
                     verify=False)
    print("=======Current Applied Revision=======")
    print(json.dumps(r.json(), indent=2))
```

NVUE CLI

```
nvos@switch:~$ nv config show
- set:
    fae:
      system:
        events:
          table-size: 600
    interface:
      eth0-1:
        acl:
```

```
          ACL_MGMT_INBOUND_CP_DEFAULT:
            inbound:
              control-plane: {}
          ACL_MGMT_INBOUND_CP_DEFAULT_IPV6:
            inbound:
              control-plane: {}
          ACL_MGMT_INBOUND_DEFAULT:
            inbound: {}
          ACL_MGMT_INBOUND_DEFAULT_IPV6:
            inbound: {}
          ACL_MGMT_OUTBOUND_CP_DEFAULT:
            outbound:
              control-plane: {}
          ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6:
            outbound:
              control-plane: {}
        type: eth
...
```

### 4.3.5.2 Replace an Entire Configuration

To replace an entire configuration:

1. Create a new revision ID with a POST:

```
nvos@switch:~$ curl -u 'admin:****' --insecure -X POST https://127.0.0.1:443/nvue_v1/revision
{
 "1": {
   "state": "pending",
   "transition": {
     "issue": {},
     "progress": ""
   }
 }
}
```

2. Record the revision ID. In the above example, the revision ID is `"1"`.
3. Do a root patch to delete the whole configuration.

```
nvos@switch:~$ curl -u 'admin:****' -d '{}' -H 'Content-Type: application/json' -k -X DELETE https://
127.0.0.1:443/nvue_v1/?rev=1
{}
```

4. Do a root patch to update the switch with the new configuration.

```
nvos@switch:~$ curl -u 'admin:****' -d '{
   "system": {
     "hostname": "switch01"
   },
   "interface": {
     "eth0": {
       "ip": {
         "address": {
           "192.168.200.6/24": {}
         },
       },
       "type": "eth"
     },
   }
 }' -H 'Content-Type: application/json' -k -X PATCH https://127.0.0.1:443/nvue_v1/?rev=1
{}
```

5. Apply the changes with a PATCH to the revision changeset.
   Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -H 'Content-Type:application/json' -d '{"state": "apply", "auto-
prompt": {"ays": "ays_yes"}}' -k -X PATCH https://127.0.0.1:443/nvue_v1/revision/1
{
  "state": "apply",
  "transition": {
    "issue": {},
    "progress": ""
  }
}
```

   NVUE CLI

```
nvos@switch:~$ nv config apply
```

6. Review the status of the apply and the configuration:
   Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -k -X GET https://127.0.0.1:443/nvue_v1/revision/1
{
  "state": "applied",
  "transition": {
    "issue": {},
    "progress": ""
  }
}
```

```
nvos@switch:~$ curl -u 'admin:****' --insecure https://127.0.0.1:443/nvue_v1/system
{
  "build": "NVOS Debian GNU/Linux 11 (bullseye)",
  "date-time": "2024-08-05 07:42:28",
  "health-status": "OK",
  "hostname": "switch",
  "platform": "x86_64-nvidia_q3200_ra-r0",
  "product-name": "nvos",
  "product-release": "25.02.0936-010",
  "status": "System is ready",
  "swap-memory": "0 MB used / 0 MB free / 0 MB total",
  "system-memory": "3250 MB used / 12564 MB free / 15814 MB total",
  "timezone": "Asia/Jerusalem",
  "uptime": 11659,
  "version": {
    "build-date": "Fri Jul 19 14:24:17 UTC 2024",
    "image": "nvos-25.02.0936-010",
    "kernel": "5.10.0-23-2-amd64",
    "onie": "2023.11-5.3.0012-rc6-115200-dev"
  }
}
```

## Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def create_nvue_changest():
    r = requests.post(url=nvue_end_point + "/revision",
                      auth=auth,
                      verify=False)
    print_request(r.request)
    print_response(r)
    response = r.json()
    changeset = response.popitem()[0]
    return changeset

def apply_nvue_changeset(changeset):
    apply_payload = {"state": "apply", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/" + requests.utils.quote(changeset,
                                                               safe="")
    r = requests.patch(url=url,
                       auth=auth,
                       verify=False,
                       data=json.dumps(apply_payload),
                       headers=mime_header)
    print_request(r.request)
    print_response(r)
```

```
def is_config_applied(changeset) -> bool:
    # Check if the configuration was indeed applied
    global RETRIES
    global POLL_APPLIED
    retries = RETRIES
    while retries > 0:
        r = requests.get(url=nvue_end_point + "/revision/" + requests.utils.quote(changeset, safe=""),
                         auth=auth,
                         verify=False)
        response = r.json()
        print(response)
        if response["state"] == "applied":
            return True
        retries -= 1
        time.sleep(POLL_APPLIED)

    return False

def apply_new_config(path,payload):
    # Create a new revision ID
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # Delete existing configuration
    query_string = {"rev": changeset}
    r = requests.delete(url=nvue_end_point + path,
                        auth=auth,
                        verify=False,
                        params=query_string,
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Patch the new configuration

    query_string = {"rev": changeset}
    r = requests.patch(url=nvue_end_point + path,
                        auth=auth,
                        verify=False,
                        data=json.dumps(payload),
                        params=query_string,
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the changes to the new revision changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
    is_config_applied(changeset)

def nvue_get(path):
    r = requests.get(url=nvue_end_point + path,
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":
    payload = {
      "system": {
        "hostname": "switch01"
      },
      "interface": {
        "eth0": {
          "ip": {
            "address": {
              "192.168.200.6/24": {}
            },
          },
          "type": "eth"
        }
      },
    }
    apply_new_config("/",payload)
    time.sleep(DUMMY_SLEEP)
    print("=====Verifying some of the configurations=====")
    nvue_get("/system")
    nvue_get("/interface")
```

## NVUE CLI

```
nvos@switch:~$ nv show system
                operational
---------------  -------------------------------------------
build            NVOS Debian GNU/Linux 11 (bullseye)
uptime           3:20:04
hostname         croc-88-mgmt2
product-name     nvos
product-release  25.02.0936-010
platform         x86_64-nvidia_q3200_ra-r0
system-memory    3268 MB used / 12546 MB free / 15814 MB total
swap-memory      0 MB used / 0 MB free / 0 MB total
health-status    Not OK
date-time        2024-08-05 07:48:13
status           System is ready
timezone         Asia/Jerusalem
```

### 4.3.5.3 Make a Configuration Change

To make a configuration change:

1. Create a new revision ID with a POST:

```
nvos@switch:~$ curl -u 'admin:****' --insecure -X POST https://127.0.0.1:443/nvue_v1/revision
{
   "2": {
   "state": "pending",
   "transition": {
     "issue": {},
     "progress": ""
   }
 }
}
```

2. Record the revision ID. In the above example, the revision ID is `"2"`.
3. Make the change with a PATCH and link it to the revision ID:
   Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -d '{"99.99.99.99/32": {}}' -H 'Content-Type: application/json' -k -X
PATCH https://127.0.0.1:443/nvue_v1/interface/eth0/ip/address?rev=2
{
  "99.99.99.99/32": {}
}
```

   NVUE CLI

```
nvos@switch:~$ nv set interface eth0 ip address 99.99.99.99/32
```

4. Apply the changes with a PATCH to the revision changeset:
   Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -H 'Content-Type:application/json' -k -X PATCH https://127.0.0.1:443/
nvue_v1/revision/2
{
  "state": "apply",
  "transition": {
    "issue": {},
    "progress": ""
  }
}
```

   NVUE CLI

```
nvos@switch:~$ nv config apply
```

5. Review the status of the apply and the configuration:
   Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -k -X GET https://127.0.0.1:443/nvue_v1/revision/2
{
  "state": "applied",
  "transition": {
    "issue": {},
    "progress": ""
  }
}
```

```
nvos@switch:~$ curl -u 'admin:****' -k -X GET https://127.0.0.1:443/nvue_v1/revision/2
{
  "state": "applied",
  "transition": {
    "issue": {},
    "progress": ""
  }
}
```

## Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def create_nvue_changest():
    r = requests.post(url=nvue_end_point + "/revision",
                      auth=auth,
                      verify=False)
    print_request(r.request)
    print_response(r)
    response = r.json()
    changeset = response.popitem()[0]
    return changeset

def apply_nvue_changeset(changeset):
    apply_payload = {"state": "apply", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/" + requests.utils.quote(changeset,
                                                               safe="")
    r = requests.patch(url=url,
                       auth=auth,
                       verify=False,
                       data=json.dumps(apply_payload),
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

def is_config_applied(changeset) -> bool:
    # Check if the configuration was indeed applied
    global RETRIES
    global POLL_APPLIED
    retries = RETRIES
    while retries > 0:
        r = requests.get(url=nvue_end_point + "/revision/" + requests.utils.quote(changeset, safe=""),
                         auth=auth,
                         verify=False)
        response = r.json()
        print(response)
        if response["state"] == "applied":
            return True
        retries -= 1
        time.sleep(POLL_APPLIED)

    return False

def apply_new_config(path,payload):
    # Create a new revision ID
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # Delete existing configuration
    query_string = {"rev": changeset}
    r = requests.delete(url=nvue_end_point + path,
                        auth=auth,
                        verify=False,
                        params=query_string,
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Patch the new configuration

    query_string = {"rev": changeset}
    r = requests.patch(url=nvue_end_point + path,
                       auth=auth,
                       verify=False,
                       data=json.dumps(payload),
                       params=query_string,
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the changes to the new revision changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
```

```
    is_config_applied(changeset)

def nvue_get(path):
    r = requests.get(url=nvue_end_point + path,
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":
    payload = {
        "99.99.99.99/32": {}
    }
    apply_new_config("/interface/eth0/ip/address",payload)
    time.sleep(DUMMY_SLEEP)
    nvue_get("/interface/eth0/ip/address")
```

NVUE CLI

```
nvos@switch:~$ nv show interface eth0 ip address

-------------
99.99.99.99/32
127.0.0.1/8
::1/128
```

## 4.3.6 View Differences Between Configurations

To view differences between configurations, run the API `GET /nvue_v1/<resource>?rev=<rev-A>&diff=<rev-B>` method with the configurations you want to `diff`. This method is equivalent to the NVUE `nv config diff <rev-A> <rev-B>` command.

To see the difference between the startup revision and the applied revision:

```
$ curl -u 'admin:****' --insecure -X GET /nvue_v1/interface?rev=startup&diff=applied
```

To see the difference between revision 1 and revision 2:

```
$ curl -u 'admin:****' --insecure -X GET /nvue_v1/<resource>?rev=1&diff=2
```

The order of the revisions can be changed; for example, `GET /nvue_v1/<resource>?rev=2&diff=1`.

## 4.3.7 Troubleshoot Configuration Changes

When a configuration change fails, you see an error in the change request.

### 4.3.7.1 Configuration Apply Fails with Warnings

In some cases, such as the first push with NVUE or if you change a file manually instead of using NVUE, you see a warning prompt and the apply fails.

```
nvos@switch:~$ curl -u 'admin:****' --insecure -X GET https://127.0.0.1:443/nvue_v1/revision/6
{
  "6": {
    "state": "ays_fail",
    "transition": {
      "issue": {
        "0": {
          "code": "client_timeout",
          "data": {},
          "message": "Timeout while waiting for client response",
          "severity": "error"
```

```
        }
      },
      "progress": "Aborted apply after warnings"
    }
  }
```

To resolve this issue, observe the failures or errors, then inspect the configuration that you are trying to apply. After you resolve the errors, retry the API. If you prefer to overlook the errors and force an apply, add `"auto-prompt":{"ays": "ays_yes"}` to the configuration apply.

```
nvos@switch:~$ curl -u 'admin:****' -d '{"state":"apply","auto-prompt":{"ays": "ays_yes"}}' -H 'Content-
Type:application/json' --insecure -X PATCH https://127.0.0.1:443/nvue_v1/revision/6
```

## 4.3.8 Save a Configuration

To save an applied configuration change to the startup configuration file ( `/etc/nvue.d/startup.yaml` ) so that the changes persist after a reboot, use a PATCH to the applied revision with the `save` state.

### Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -k -X PATCH -d '{"state": "save", "auto-prompt": {"ays": "ays_yes"}}' -H
'Content-Type: application/json'  https://127.0.0.1:443/nvue_v1/revision/applied
{
  "state": "save",
  "transition": {
    "issue": {},
    "progress": ""
  }
}
```

### Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def save_nvue_changeset():
    apply_payload = {"state": "save", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/applied"
    r = requests.patch(url=url,
                       auth=auth,
                       verify=False,
                       data=json.dumps(apply_payload),
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":
    save_nvue_changeset()
```

### NVUE CLI

```
nvos@switch:~$ nv config save
saved
```

## 4.3.9 Unset a Configuration Change

To unset a change, use the `null` value to the key. For example, to delete start configuration from eth1 port, use the following syntax:

```
nvos@switch:~$ curl -u 'admin:****' -d '{"eth1":null}' -H 'Content-Type: application/json' --insecure -X PATCH
https://127.0.0.1:443/nvue_v1/interface/rev=4
```

When you unset a change, you must still use the `PATCH` action. The value indicates removal of the entry. The data is `{"eth1":null}` with the PATCH action.

## 4.3.10 Use the API for Active Monitoring

The example below fetches the counters for `interface sw1p1`.

### Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -k -X GET https://127.0.0.1:443/nvue_v1/interface/sw1p1/link/counters
{
  "buffer-overrun-errors": 0,
  "in-bytes": 16128,
  "in-drops": 0,
  "in-errors": 0,
  "in-pkts": 56,
  "in-symbol-errors": 0,
  "link-downed": 0,
  "link-error-recovery": 0,
  "local-link-integrity-errors": 0,
  "out-bytes": 16128,
  "out-drops": 0,
  "out-errors": 0,
  "out-pkts": 56,
  "out-wait": 0,
  "port-rcv-constraint-errors": 0,
  "port-rcv-remote-physical-errors": 0,
  "port-rcv-switch-relay-errors": 0,
  "qp1-drops": 0,
  "rcv-icrc-errors": 0,
  "tx-parity-errors": 0
}
```

### Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

if __name__ == "__main__":
    r = requests.get(url=nvue_end_point + "/interface/sw1p1/link/counters",
                     auth=auth,
                     verify=False)
    print("=======Interface sw1p1 Counters=======")
    print(json.dumps(r.json(), indent=2))
```

### NVUE CLI

```
nvos@switch:~$ nv show interface sw1p1 link counters --view detail
```

```
                                operational  description
------------------------------  -----------
------------------------------------------------------------------------
in-bytes                        15.75 KB     Total number of bytes received on the interface
in-pkts                         56           Total number of packets received on the interface
in-drops                        0            Number of received packets dropped
in-errors                       0            Number of received packets with errors
out-bytes                       15.75 KB     Total number of bytes transmitted out of the interface
out-pkts                        56           Total number of packets transmitted out of the interface
out-drops                       0            The number of outbound packets that were chosen to be discarded even
                                             though no errors had been detected to prevent their being
transmitted.
out-errors                      0            The number of outbound packets that could not be transmitted because
                                             of errors.
in-symbol-errors                0            Total number of minor errors detected on one or more physical lanes
out-wait                        0            The number of ticks during which the port selected by PortSelect had
                                             data to transmit but no data was sent during the entire tick because
                                             of insufficient credits or of lack of arbitration.
link-error-recovery             0            Total number of times the Port Training state machine has
successfully
                                             completed the link error recovery process
link-downed                     0            Total number of times the Port Training state machine has failed the
                                             link error recovery process and downed the link
port-rcv-remote-physical-errors 0            Total number of packets marked with the EBP delimiter received on the
                                             port
port-rcv-switch-relay-errors    0            Total number of packets received on the port that were discarded
                                             because they could not be forwarded by the switch relay
port-rcv-constraint-errors      0            Total number of packets received on the switch physical port that are
                                             discarded due to constraints
local-link-integrity-errors     0            Total number of times that the count of local physical errors
exceeded
                                             the threshold specified by Local Phy Errors
qp1-drops                       0            Total number of QP1 MADs (packets) dropped due to resource
limitations
buffer-overrun-errors           0            The number of times that Overrun-Errors consecutive flow control
                                             update periods occur
rcv-icrc-errors                 0            Total number of icrc payload corruption rx errors
tx-parity-errors                0            Total number of icrc payload corruption tx parity errors
```

## 4.3.11 Retrieve View Types

NVUE provides views for certain `show` commands. A view is a subset of information.

To see the views available for a show command, run the command with `--view` and press TAB:

```
nvos@switch:~$ nv show interface --view <<TAB>>
brief             detail            link-diagnostics  lldp              mac               small
```

To retrieve view types through the REST API, you use the `curl -u 'admin:****' -k -X GET http://path?view=<brief>` syntax. For example, the equivalent REST API method for the NVUE `nv show interface --view=brief` command is:

```
nvos@switch:~$ curl -u 'admin:****' -k -X GET https://127.0.0.1:443/nvue_v1/interface?view=brief
```

## 4.3.12 Convert CLI Changes to Use the API

You can take a configuration change from the CLI and use the API to configure the same set of changes.

1. Make your configuration changes on the system with the NVUE CLI.

```
nvos@switch:~$ nv set system hostname switch01
nvos@switch:~$ nv set interface eth0 ip address 192.168.200.6/24
```

2. View the changes as a JSON blob.

```
nvos@switch:~$ nv config diff -o json
[
  {
    "set": {
      "interface": {
        "eth0": {
```

```
          "ip": {
            "address": {
              "192.168.200.6/24": {}
            }
          }
        }
      },
      "system": {
        "hostname": "switch01"
      }
    }
  }
]
```

3. Staple the JSON blob to a root patch request as the payload.

```
nvos@switch:~$ curl -u 'admin:****' -d '{
      "interface": {
        "eth0": {
          "ip": {
            "address": {
              "192.168.200.6/24": {}
            }
          }
        }
      },
      "system": {
        "hostname": "switch01"
      }
    }' -k -X PATCH https://127.0.0.1:443/nvue_v1/?rev=3
```

4. Apply the changes with a PATCH to the revision changeset.

```
nvos@switch:~$ curl -u 'admin:****' -H 'Content-Type:application/json' -k -d '{"state": "apply", "auto-
prompt": {"ays": "ays_yes"}}' -X PATCH https://127.0.0.1:443/nvue_v1/revision/3
{
  "state": "apply",
  "transition": {
    "issue": {},
    "progress": ""
  }
}
```

5. Review the status of the apply and the configuration:
   Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -k -X GET https://127.0.0.1:443/nvue_v1/revision/3
{
  "state": "applied",
  "transition": {
    "issue": {},
    "progress": ""
  }
}
```

   Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
```

```
    print("Body:", json.dumps(r.json(), indent=2))

def create_nvue_changest():
    r = requests.post(url=nvue_end_point + "/revision",
                      auth=auth,
                      verify=False)
    print_request(r.request)
    print_response(r)
    response = r.json()
    changeset = response.popitem()[0]
    return changeset

def apply_nvue_changeset(changeset):
    # apply_payload = {"state": "apply"}
    apply_payload = {"state": "apply", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/" + requests.utils.quote(changeset,
                                                               safe="")
    r = requests.patch(url=url,
                       auth=auth,
                       verify=False,
                       data=json.dumps(apply_payload),
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

def is_config_applied(changeset) -> bool:
    # Check if the configuration was indeed applied
    global RETRIES
    global POLL_APPLIED
    retries = RETRIES
    while retries > 0:
        r = requests.get(url=nvue_end_point + "/revision/" + requests.utils.quote(changeset, safe=""),
                         auth=auth,
                         verify=False)
        response = r.json()
        print(response)

        if response["state"] == "applied":
            return True
        retries -= 1
        time.sleep(POLL_APPLIED)

    return False

def apply_new_config(path,payload):
    # Create a new revision ID
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # Delete existing configuration
    query_string = {"rev": changeset}
    r = requests.delete(url=nvue_end_point + path,
                       auth=auth,
                       verify=False,
                       params=query_string,
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Patch the new configuration

    query_string = {"rev": changeset}
    r = requests.patch(url=nvue_end_point + path,
                       auth=auth,
                       verify=False,
                       data=json.dumps(payload),
                       params=query_string,
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the changes to the new revision changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
    is_config_applied(changeset)

def nvue_get(path):
    r = requests.get(url=nvue_end_point + path,
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":
    payload = {
      "interface": {
        "eth": {
          "ip": {
            "address": {
              "192.168.200.6/24": {}
            }
          }
        }
      },
      "system": {
        "hostname": "switch01"
      }
    }
    apply_new_config("/",payload)
    time.sleep(DUMMY_SLEEP)
    nvue_get("/interface/eth0")
    nvue_get("/system")
```

## 4.3.13 API Examples

The following section provides practical API examples.

### 4.3.13.1 Configure the System

To set the system hostname, pre-login or post-login message, and time zone on the switch, send a targeted API request to `/nvue_v1/system`.

#### Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -d '{"system": {"hostname":"switch01","timezone":"America/
Los_Angeles","message":{"pre-login":"Welcome to NVOS","post-login":"You have successfully logged in to
switch01"}}}' -k -X PATCH https://127.0.0.1:443/nvue_v1/?rev=4
```

#### Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def create_nvue_changest():
    r = requests.post(url=nvue_end_point + "/revision",
                      auth=auth,
                      verify=False)
    print_request(r.request)
    print_response(r)
    response = r.json()
    changeset = response.popitem()[0]
    return changeset

def apply_nvue_changeset(changeset):
    # apply_payload = {"state": "apply"}
    apply_payload = {"state": "apply", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/" + requests.utils.quote(changeset,
                                                               safe="")

    r = requests.patch(url=url,
                       auth=auth,
                       verify=False,
                       data=json.dumps(apply_payload),
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

def is_config_applied(changeset) -> bool:
    # Check if the configuration was indeed applied
    global RETRIES
    global POLL_APPLIED
    retries = RETRIES
    while retries > 0:
        r = requests.get(url=nvue_end_point + "/revision/" + requests.utils.quote(changeset, safe=""),
                         auth=auth,
                         verify=False)
        response = r.json()
        print(response)

        if response["state"] == "applied":
            return True
        retries -= 1
```

```
        time.sleep(POLL_APPLIED)

    return False

def apply_new_config(path,payload):
    # Create a new revision ID
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # Delete existing configuration
    query_string = {"rev": changeset}
    r = requests.delete(url=nvue_end_point + path,
                        auth=auth,
                        verify=False,
                        params=query_string,
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Patch the new configuration

    query_string = {"rev": changeset}
    r = requests.patch(url=nvue_end_point + path,
                        auth=auth,
                        verify=False,
                        data=json.dumps(payload),
                        params=query_string,
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the changes to the new revision changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
    is_config_applied(changeset)

def nvue_get(path):
    r = requests.get(url=nvue_end_point + path,
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":
    payload = {
      "system":
      {
        "hostname":"switch01",
        "timezone":"America/Los_Angeles",
        "message":
        {
          "pre-login":"Welcome to NVOS",
          "post-login:"You have successfully logged in to switch01"
        }
      }
    }
    apply_new_config("/",payload) # Root patch
    time.sleep(DUMMY_SLEEP)
    nvue_get("/system")
```

### NVUE CLI

```
nvos@switch:~$ nv set system hostname switch01
nvos@switch:~$ nv set system timezone America/Los_Angeles
nvos@switch:~$ nv set system message pre-login "Welcome to NVOS"
nvos@switch:~$ nv set system message post-login "You have successfully logged into switch01"
```

## 4.3.13.2 Configure Services

To set up NTP, SYSLOG, and SNMP on the switch, send a targeted API request to `/nvue_v1/system`.

### Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -d '{"system": { "ntp": {"server":{"4.nvos.pool.ntp.org":{}}}}}' -k -X PATCH
https://127.0.0.1:443/nvue_v1/?rev=5
```

### Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time
```

```
auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def create_nvue_changest():
    r = requests.post(url=nvue_end_point + "/revision",
                      auth=auth,
                      verify=False)
    print_request(r.request)
    print_response(r)
    response = r.json()
    changeset = response.popitem()[0]
    return changeset

def apply_nvue_changeset(changeset):
    # apply_payload = {"state": "apply"}
    apply_payload = {"state": "apply", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/" + requests.utils.quote(changeset,
                                                               safe="")

    r = requests.patch(url=url,
                       auth=auth,
                       verify=False,
                       data=json.dumps(apply_payload),
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

def is_config_applied(changeset) -> bool:
    # Check if the configuration was indeed applied
    global RETRIES
    global POLL_APPLIED
    retries = RETRIES
    while retries > 0:
        r = requests.get(url=nvue_end_point + "/revision/" + requests.utils.quote(changeset, safe=""),
                         auth=auth,
                         verify=False)
        response = r.json()
        print(response)

        if response["state"] == "applied":
            return True
        retries -= 1
        time.sleep(POLL_APPLIED)

    return False

def apply_new_config(path,payload):
    # Create a new revision ID
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # Delete existing configuration
    query_string = {"rev": changeset}
    r = requests.delete(url=nvue_end_point + path,
                        auth=auth,
                        verify=False,
                        params=query_string,
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Patch the new configuration

    query_string = {"rev": changeset}
    r = requests.patch(url=nvue_end_point + path,
                       auth=auth,
                       verify=False,
                       data=json.dumps(payload),
                       params=query_string,
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the changes to the new revision changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
    is_config_applied(changeset)

def nvue_get(path):
    r = requests.get(url=nvue_end_point + path,
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":
    payload = {
      "system":
```

```
      {
        "ntp":
        {
          "server:
            {
              "4.nvos.pool.ntp.org": {}
            }
        },
      }
    }
    apply_new_config("/",payload) # Root patch
    time.sleep(DUMMY_SLEEP)
    nvue_get("/system/ntp")
```

### NVUE CLI

```
nvos@switch:~$ nv set system ntp server 4.nvos.pool.ntp.org
```

## 4.3.13.3 Configure Users

The following example creates a new user, then deletes the user.

### Curl Command

This example creates a new user called `test1`.

```
nvos@switch:~$ curl -u 'admin:****' -d '{"system": {"aaa": {"user": {"test1": {"hashed-
password":"72b28582708d749c6c82f3b3f226041f1bd37090281641eaeba8d44bd915d0042d609a92759d9f6fb96475cb0601cf428cd22613
df8a53a09461e0b426cf0a35","role": "monitor","state": "enabled","full-name": "Test User"}}}}}' -k -X PATCH https://
127.0.0.1:443/nvue_v1/?rev=5
```

This example deletes the `test1` user.

```
nvos@switch:~$ curl -u 'admin:****' -k -X DELETE https://127.0.0.1:443/nvue_v1/system/aaa/user/test1?rev=6
```

### Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def create_nvue_changest():
    r = requests.post(url=nvue_end_point + "/revision",
                      auth=auth,
                      verify=False)
    print_request(r.request)
    print_response(r)
    response = r.json()
    changeset = response.popitem()[0]
    return changeset

def apply_nvue_changeset(changeset):
    # apply_payload = {"state": "apply"}
    apply_payload = {"state": "apply", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/" + requests.utils.quote(changeset,
                                                               safe="")
    r = requests.patch(url=url,
```

```
                        auth=auth,
                        verify=False,
                        data=json.dumps(apply_payload),
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

def is_config_applied(changeset) -> bool:
    # Check if the configuration was indeed applied
    global RETRIES
    global POLL_APPLIED
    retries = RETRIES
    while retries > 0:
        r = requests.get(url=nvue_end_point + "/revision/" + requests.utils.quote(changeset, safe=""),
                         auth=auth,
                         verify=False)
        response = r.json()
        print(response)

        if response["state"] == "applied":
            return True
        retries -= 1
        time.sleep(POLL_APPLIED)

    return False

def apply_new_config(path,payload):
    # Create a new revision ID
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # Delete existing configuration
    query_string = {"rev": changeset}
    r = requests.delete(url=nvue_end_point + path,
                        auth=auth,
                        verify=False,
                        params=query_string,
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Patch the new configuration

    query_string = {"rev": changeset}
    r = requests.patch(url=nvue_end_point + path,
                        auth=auth,
                        verify=False,
                        data=json.dumps(payload),
                        params=query_string,
                        headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the changes to the new revision changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
    is_config_applied(changeset)

def delete_config(path):
    # Create an NVUE changeset
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # Equivalent to JSON `null`
    payload = None

    # Stage the change
    query_string = {"rev": changeset}
    r = requests.delete(url=nvue_end_point + path,
                         auth=auth,
                         verify=False,
                         data=json.dumps(payload),
                         params=query_string,
                         headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the staged changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
    is_config_applied(changeset)

def nvue_get(path):
    r = requests.get(url=nvue_end_point + path,
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":

    # Need to create a hashed password - The supported password
    # Here in this example, we use SHA-512
    import crypt
    hashed_password = crypt.crypt("hello$world#2023", salt=crypt.METHOD_SHA512)
    payload = {
        "system": {
            "aaa": {
                "user": {
                    "test1": {
                        "hashed-password": hashed_password,
                        "role": "monitor",
```

```
                        "state": "enabled",
                        "full-name": "Test User",
                    }
                }
            }
        }
    }
    apply_new_config("/",payload) # Root patch
    time.sleep(DUMMY_SLEEP)
    nvue_get("/system/user/aaa")

    """Delete an existing user account using the AAA API."""
    delete_config("/system/aaa/user/test1")
    time.sleep(DUMMY_SLEEP)
    nvue_get("/system/user/aaa")
```

### NVUE CLI

This example creates a new user `test1`.

```
nvos@switch:~$ nv set system aaa user test1
nvos@switch:~$ nv set system aaa user test1 full-name "Test User"
nvos@switch:~$ nv set system aaa user test1 password "abcd@test"
nvos@switch:~$ nv set system aaa user test1 role monitor
nvos@switch:~$ nv set system aaa user test1 state enabled
```

This example deletes the user `test1`.

```
nvos@switch:~$ nv unset system aaa user test1
```

## 4.3.13.4 Configure an Interface

The following example configures an interface.

### Curl Command

```
nvos@switch:~$ curl -u 'admin:****' -k -d '{"eth1": {"link":{"state":{"up": {}}}}}' -H 'Content-Type: application/
json' -k -X PATCH https://127.0.0.1:443/nvue_v1/interface?rev=21
```

### Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def create_nvue_changest():
    r = requests.post(url=nvue_end_point + "/revision",
                      auth=auth,
                      verify=False)
    print_request(r.request)
    print_response(r)
    response = r.json()
    changeset = response.popitem()[0]
    return changeset

def apply_nvue_changeset(changeset):
    # apply_payload = {"state": "apply"}
```

```
    apply_payload = {"state": "apply", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/" + requests.utils.quote(changeset,
                                                                safe="")
    r = requests.patch(url=url,
                       auth=auth,
                       verify=False,
                       data=json.dumps(apply_payload),
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

def is_config_applied(changeset) -> bool:
    # Check if the configuration was indeed applied
    global RETRIES
    global POLL_APPLIED
    retries = RETRIES
    while retries > 0:
        r = requests.get(url=nvue_end_point + "/revision/" + requests.utils.quote(changeset, safe=""),
                         auth=auth,
                         verify=False)
        response = r.json()
        print(response)

        if response["state"] == "applied":
            return True
        retries -= 1
        time.sleep(POLL_APPLIED)

    return False

def apply_new_config(path,payload):
    # Create a new revision ID
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # Delete existing configuration
    query_string = {"rev": changeset}
    r = requests.delete(url=nvue_end_point + path,
                       auth=auth,
                       verify=False,
                       params=query_string,
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Patch the new configuration

    query_string = {"rev": changeset}
    r = requests.patch(url=nvue_end_point + path,
                       auth=auth,
                       verify=False,
                       data=json.dumps(payload),
                       params=query_string,
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the changes to the new revision changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
    is_config_applied(changeset)

def nvue_get(path):
    r = requests.get(url=nvue_end_point + path,
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":
    payload = {
      "eth1":
      {
        "type": "eth",
        "link":
        {
          "state":"up"
          }
        }
      }
    apply_new_config("/interface",payload)
    time.sleep(DUMMY_SLEEP)
    nvue_get("/interface/eth1")
```

## NVUE CLI

```
nvos@switch:~$ nv set interface eth1
```

### 4.3.13.5 Action Operations

The NVUE action operations are ephemeral operations that do not modify the state of the configuration; they reset counters for interfaces, reboot the system etc...

#### Curl Command

To clear counters on sw1p1:

```
nvos@switch:~$ curl -u 'admin:****' -H 'Content-Type:application/json' -d '{"@clear": {"state": "start",
"parameters": {}}}' -k -X POST https://127.0.0.1:443/nvue_v1/interface/sw1p1/link/counters
1
nvos@switch:~$ curl -u 'admin:****' -X GET https://127.0.0.1:443/nvue_v1/action/1 -k
{"detail":"sw1p1 counters cleared.","http_status":200,"issue":[],"state":"action_success","status":"sw1p1 counters
cleared.","timeout":60,"type":""}
```

#### Python Code

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def nvue_action():
    r = requests.post(url=nvue_end_point + path,
                      auth=auth,
                      verify=False,
                      data=json.dumps(apply_payload),
                      headers=mime_header)
    print_request(r.request)
    print_response(r)
    return response

def nvue_get(path):
    r = requests.get(url=nvue_end_point + path,
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

if __name__ == "__main__":
    payload = {
      "@clear":
      {
        "state": "start",
        "parameters": {}
      }
    }
    action_id=nvue_action("/interface/sw1p1/link/counters",payload)
    time.sleep(DUMMY_SLEEP)
    nvue_get(f"/action/{action_id}")
```

#### NVUE CLI

```
nvos@switch:~$ nv action clear interface sw1p1 link counters
```

## 4.3.14 Example Python Script

In the following python example, the `full_config_example()` method sets the system pre-login message, and changes a few other configuration settings in a single bulk operation. The API endpoint goes to the root node `/nvue_v1`.

```
#!/usr/bin/env python3

import requests
from requests.auth import HTTPBasicAuth
import json
import time

auth = HTTPBasicAuth(username="admin", password="password")
nvue_end_point = "https://127.0.0.1:443/nvue_v1"
mime_header = {"Content-Type": "application/json"}

DUMMY_SLEEP = 5  # In seconds
POLL_APPLIED = 1  # in seconds
RETRIES = 10

def print_request(r: requests.Request):
    print("=======Request=======")
    print("URL:", r.url)
    print("Headers:", r.headers)
    print("Body:", r.body)

def print_response(r: requests.Response):
    print("=======Response=======")
    print("Headers:", r.headers)
    print("Body:", json.dumps(r.json(), indent=2))

def sanity():
    # Basic retrieval to check connectivity
    r = requests.get(url=nvue_end_point + "/system",
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

def create_nvue_changest():
    r = requests.post(url=nvue_end_point + "/revision",
                      auth=auth,
                      verify=False)
    print_request(r.request)
    print_response(r)
    response = r.json()
    changeset = response.popitem()[0]
    return changeset

def apply_nvue_changeset(changeset):
    # apply_payload = {"state": "apply"}
    apply_payload = {"state": "apply", "auto-prompt": {"ays": "ays_yes"}}
    url = nvue_end_point + "/revision/" + requests.utils.quote(changeset,
                                                               safe="")

    r = requests.patch(url=url,
                       auth=auth,
                       verify=False,
                       data=json.dumps(apply_payload),
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

def full_config_example():
    # Create an NVUE changeset
    changeset = create_nvue_changest()
    print("Using NVUE Changeset: '{}'".format(changeset))

    # https://www.asciiart.eu/comics/batman
    pre_login_message = u"""
                  ,.ood888888888888boo.,
              .od888P^""            ""^Y888bo.
          .od8P''   ..oood88888888booo.    ``Y8bo.
      .odP'"  .ood8888888888888888888888boo.  "`Ybo.
     .d8'   od8'd888888888f`8888't888888888b`8bo   `Yb.
    d8'  od8^   8888888888[  `'  ]8888888888   ^8bo  `8b
  .8P  d88'     8888888888P      Y8888888888     `88b  Y8.
 d8' .d8'       `Y88888888'      `88888888P'       `8b. `8b
.8P .88P            """"            """"             Y88. Y8.
88  888                                                 888  88
88  888                                                 888  88
88  888.        ..                          ..         .888  88
`8b `88b,     d8888b.od8bo.      .od8bo.d8888b     ,d88' d8'
 Y8. `Y88.    8888888888888b    d8888888888888    .88P' .8P
  `8b  Y88b.  `88888888888888  88888888888888'  .d88P  d8'
    Y8.  ^Y88bod8888888888888..8888888888888bod88P^  .8P
     `Y8.   ^Y888888888888888LS888888888888888P^   .8P'
       `^Yb.,  `^^Y888888888888888888888P^^'  ,.dP^'
          `^Y8b..   ``^^^Y88888888P^^^'    ..d8P^'
              `^Y888bo.,            ,.od888P^'
                  "`^^Y888888888888P^^'"
"""

    # https://www.asciiart.eu/comics/superman
```

```
    post_login_message = u'''
        ____________________________________________
      //::::::::::::::::::::::::::::::::::::::::::::\\
    //:::_______::::::::::_________::::::::::_____::::::::\\
  //:::_/    _-"":::_--"""         """--_::::\_   ):::::::::\\
 //:::/    /::::::_"                     "-_:::\/::::::|^\:::\\
//:::/   /~::::::I__                         \::::::::::|  \:::\\
\\:::\   (::::::::::"""---____________      "--------"  /::://
 \\:::\  |::::::::::::::::::::::::::::::"""==____       /::://
  \\:::"\/::::::::::::::::::::::::::::::::::::::::\   /~::://
    \\::::::::::::::::::::::::::::::::::::::::::::)/~::://
      \\::::\""""""------_____:::::::::::::::::::::::::://
        \\:::"\                 """"-----_____:::::://
          \\:::"\     __----__                    )::://
            \\:::"\/~::::::::~\_            __/~::// 
              \\::::::::::::::::""----""""::::// 
                \\::::::::::::::::::::::::::::// 
                  \\:::\^""--._.--""^/:::// 
                    \\::"\          /"::// 
                      \\::"\      /"::// 
                        \\::"\_/"::// 
                          \\:::::// 
                            \\_// 
                              "
'''

    # Prepare payload which configures a few
    # different switch configurations
    payload = {
        "interface":{
            "eth0":{
                "description": "management port"
            }
        },
        "system":{
            "message":{
                "pre-login": pre_login_message,
                "post-login": post_login_message
            },
            "timezone": "Europe/Paris",
        },
    }
    # Stage the change
    query_string = {"rev": changeset}
    r = requests.patch(url=nvue_end_point + "/",  # Root patch
                       auth=auth,
                       verify=False,
                       data=json.dumps(payload),
                       params=query_string,
                       headers=mime_header)
    print_request(r.request)
    print_response(r)

    # Apply the staged changeset
    apply_nvue_changeset(changeset)

    # Check if the changeset was applied
    is_config_applied(changeset)


def message_get():
    # Get the system pre-login/post-login
    # message that was configured.
    r = requests.get(url=nvue_end_point + "/system/message",
                     auth=auth,
                     verify=False)
    print_request(r.request)
    print_response(r)

def is_config_applied(changeset) -> bool:
    # Check if the configuration was indeed applied
    global RETRIES
    global POLL_APPLIED
    retries = RETRIES
    while retries > 0:
        r = requests.get(url=nvue_end_point + "/revision/" + requests.utils.quote(changeset, safe=""),
                         auth=auth,
                         verify=False)
        response = r.json()
        print(response)

        if response["state"] == "applied":
            return True
        retries -= 1
        time.sleep(POLL_APPLIED)

    return False

if __name__ == "__main__":
    sanity()
    time.sleep(DUMMY_SLEEP)
    full_config_example()
    time.sleep(DUMMY_SLEEP)
    message_get()
```

## 4.3.15 Try the API

To try out the NVUE REST API, use the NVUE API Lab available on NVIDIA Air. The lab provides a basic example to help you get started. You can also try out the other examples in this document.

## 4.3.16 Resources

For information about using the NVUE REST API, refer to the NVUE API Swagger documentation. The full object model download is available here.

## 4.3.17 Considerations

- Unlike the NVUE CLI, the NVUE API does not support configuring a plain text password for a user account; you must configure a hashed password for a user account with the NVUE API.
- If you need to make multiple updates on the switch, NVIDIA recommends you use a root patch, which can make configuration changes with fewer round trips to the switch. Running many specific NVUE PATCH APIs to set or unset objects requires many round trips to the switch to set up the HTTP connection, transfer payload and responses, manage network utilization, and so on.

## 4.3.18 Related Information

- NGINX documentation
- Ubuntu Certificates and Security documentation
- Python requests module

## 4.3.19 Save the Applied Configurations

1. Send a PATCH request to save the currently applied configuration.

```
curl -u '<username:password>'--insecure --request PATCH 'https://<IP>/nvue_v1/revision/applied' -H 'Content-Type:
application/json' -d '{"state": "save"}'
```

## 4.3.20 Send an Action

1. Run the nv action disconnect

```
$ curl -u '<username:password>'  --insecure https://<IP>/nvue_v1/system/aaa/user -H 'Content-Type: application/
json' -d '
{"@disconnect": {"state": "start", "parameters": {"user": "monitor"}
}
}'

3
```

2. Get the action ID from response; "3"

3. Check status

```
$ curl -u '<username:password>' --request GET 'https://<IP>/nvue_v1/action/3'
{"detail":"all sessions have been terminated","http_status":200,"issue":[],"state":"action_success","status":"all
sessions have been terminated","timeout":60,"type":""}
```

# 5 System Management

The following pages provide information on configuring general management features on the switch system.


- Access Control Lists
- Attestation
- Authentication Authorization and Accounting
- Certificates Management
- Control and Power
- DNS Server
- Documentation
- Hostname
- Link Layer Discovery Protocol
- Management Interfaces
- Profile
- Resource Management
- Security
- System API
- Time Synchronization
- User Interfaces
- Zero-Touch Provisioning


## 5.1 Access Control Lists

Access Control Lists (ACLs) are rules on the switch that act as filters to manage traffic.

This section discusses the default Firewall Rules installed on the switch to protect the switch control plane and CPU from DOS and other potentially malicious network attacks and how to Configure Access Control Lists to manage traffic:


- Firewall Rules
- Access Control List Configuration
- Access Control List Commands


### 5.1.1 Firewall Rules

The NVOS default firewall rules protect the switch control plane and CPU from DOS and other potentially malicious network attacks.

The default set of firewall rules consists of IP and transport level rules. See Access Control List Configuration for custom ACL rules configurations.

> Please note that users cannot bind ACL rules to the Loopback interface (lo).

#### 5.1.1.1 DoS Rules

DoS rules protect the switch control plane and CPU from DOS attacks. NVOS provides firewall DoS rules to do the following:

- Allow only internal traffic to the loopback interfaces.
- Accept already established connections and outbound traffic.
- Drop packets if the first TCP segment is not SYN.
- Drop fragmented IP packets.
- Drop Christmas tree packets; packets with all TCP flags set.
- Drop NULL packets.
- Drop invalid packets.
- Drop strange MSS values.
- Provide brute-force protection.
- Drop packets with routing Header Type 0.
- Drop packets with a hop limit greater than 1.
- Limit excessive TCP reset packets.
- Protect against SYN flood.
- Rate limit new TCP connections for each IP address.
- Log all remaining packets, then drop them.

#### 5.1.1.2 Whitelist Rules

Whitelist rules specify the services or application ports enabled on the switch. NVOS provides firewall whitelist rules to enable TCP ports and UDP ports.

The following table lists the ports that NVOS enables by default.

| Protocol | Port | Application |
|---|---|---|
| TCP | 22 | SSH |
| UDP | 68 | DHCP Client |
| UDP | 67 | DHCP Server |
| UDP | 123 | NTP |
| UDP | 161 | SNMP |
| TCP | 389 | LDAP |
| TCP | 636 | LDAP TLS |
| UDP | 546 | DHCPv6 Client |
| UDP | 547 | DHCPv6 Server |
| UDP | 4500 | IPSec-NAT |
| UDP | 500 | IKE |
| UDP | 1812,1813,1645,1656 | RADIUS |
| TCP | 49 | TACACS |
| UDP/TCP | 53 | DNS |
| UDP | 5353 | mDNS |

| Protocol | Port | Application |
|---|---|---|
| UDP | 514 | remote syslog |
| TCP | 443 | HTTPS |
| TCP | 9339 | gNMI |
| ICMP | NA | Ping |

### 5.1.1.3 Unset the Default Firewall Rules

To unset the default firewall rules to accept packets from all addresses and protocols:

```
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_INBOUND_CP_DEFAULT
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_INBOUND_CP_DEFAULT_IPV6
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_INBOUND_DEFAULT
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_INBOUND_DEFAULT_IPV6
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6
nvos@switch:~$ nv unset interface lo acl ACL_LOOPBACK_INBOUND_CP_DEFAULT
nvos@switch:~$ nv unset interface lo acl ACL_LOOPBACK_INBOUND_CP_DEFAULT_IPV6
nvos@switch:~$ nv config apply
```

To set the firewall rules back to the default setting:

```
nvos@switch:~$ nv unset interface
nvos@switch:~$ nv config apply
```

To set the firewall rules back to the default setting on specific interface:

```
nvos@switch:~$ nv unset interface eth0 acl
nvos@switch:~$ nv config apply
```

### 5.1.1.4 Add Firewall Rules

You cannot modify the `ACL_MGMT_INBOUND_CP_DEFAULT, ACL_MGMT_INBOUND_CP_DEFAULT_IPV6, ACL_MGMT_INBOUND_DEFAULT, ACL_MGMT_INBOUND_DEFAULT_IPV6, ACL_MGMT_OUTBOUND_CP_DEFAULT, ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6, ACL_LOOPBACK_INBOUND_CP_DEFAULT` and `ACL_LOOPBACK_INBOUND_CP_DEFAULT_IPV6` rules. However, you can append or insert additional rules.

If you use non-default ports for an application, NVIDIA recommends that you add a whitelist rule for the non-default port. For example, if you use ports 3020 and 3022 for radius server accounting and authentication instead of 1812 and 1813, you can add the following whitelist rules:

```
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 765 match ip udp source-port 3020
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 765 match ip connection-state new
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 765 match ip connection-state established
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 765 action permit
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 766 match ip udp source-port  3022
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 766 match ip connection-state new
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 766 match ip connection-state established
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 766 action permit
nvos@switch:~$ nv config apply
```

### 5.1.1.5 Show Firewall Rules

To show the default rules, run the `nv show acl <default-acl-id>` command, where `<default-acl-id>` is one of `ACL_MGMT_INBOUND_CP_DEFAULT, ACL_MGMT_INBOUND_CP_DEFAULT_IPV6, ACL_MGMT_INBOUND_DEFAULT, ACL_MGMT_INBOUND_DEFAULT_IPV6, ACL_MGMT_OUTBOUND_CP_DEFAULT, ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6, ACL_LOOPBACK_INBOUND_CP_DEFAULT` and `ACL_LOOPBACK_INBOUND_CP_DEFAULT_IPV6`:

```
nvos@switch:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT
      operational  applied
----  -----------  -------
type  ipv4         ipv4


rule
=======
    Number  Summary
    ------  ----------------------------------------
    10      action:                                deny
            match.ip.dest-ip:             127.0.0.0/8
    20      action:                            permit
    30      action:                              deny
            match.ip.protocol:                    tcp
    40      action:                              deny
            match.ip.protocol:                    tcp
    50      action:                              deny
            match.ip.protocol:                    tcp
    60      action:                              deny
            match.ip.protocol:                    tcp
    70      action:                              deny
    80      action:                              deny
            match.ip.protocol:                    tcp
    90      action:                              deny
            match.ip.protocol:                    tcp
    100     action:                              deny
    110     match.ip.protocol:                    tcp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            TCP
            match.ip.tcp.dest-port:                22
    120     action:                              deny
            match.ip.protocol:                    tcp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       100
            match.ip.recent-list.name:            TCP
            match.ip.recent-list.update-interval: 60
            match.ip.tcp.dest-port:                22
    130     match.ip.protocol:                    udp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            UDP
            match.ip.udp.dest-port:               161
    140     action:                              deny
            match.ip.protocol:                    udp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       100
            match.ip.recent-list.name:            UDP
            match.ip.recent-list.update-interval: 60
            match.ip.udp.dest-port:               161
    150     match.ip.protocol:                    tcp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            TCP
            match.ip.tcp.dest-port:               443
    160     action:                              deny
            match.ip.protocol:                    tcp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       150
            match.ip.recent-list.name:            TCP
            match.ip.recent-list.update-interval: 60
            match.ip.tcp.dest-port:               443
    170     match.ip.protocol:                    tcp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            TCP
            match.ip.tcp.dest-port:              9339
    180     action:                              deny
            match.ip.protocol:                    tcp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       100
            match.ip.recent-list.name:            TCP
            match.ip.recent-list.update-interval: 60
            match.ip.tcp.dest-port:              9339
    190     match.ip.protocol:                    tcp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            TCP
            match.ip.tcp.dest-port:               636
    200     action:                              deny
            match.ip.protocol:                    tcp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       100
            match.ip.recent-list.name:            TCP
            match.ip.recent-list.update-interval: 60
            match.ip.tcp.dest-port:               636
    210     match.ip.protocol:                    tcp
```

```
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           TCP
        match.ip.tcp.dest-port:              389
220     action:                             deny
        match.ip.protocol:                   tcp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           TCP
        match.ip.recent-list.update-interval: 60
        match.ip.tcp.dest-port:              389
230     match.ip.protocol:                   tcp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           TCP
        match.ip.tcp.dest-port:               49
240     action:                             deny
        match.ip.protocol:                   tcp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           TCP
        match.ip.recent-list.update-interval: 60
        match.ip.tcp.dest-port:               49
250     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:              123
260     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:              123
270     match.ip.protocol:                   tcp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           TCP
        match.ip.tcp.dest-port:               53
280     action:                             deny
        match.ip.protocol:                   tcp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           TCP
        match.ip.recent-list.update-interval: 60
        match.ip.tcp.dest-port:               53
290     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:               53
300     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:               53
310     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:              514
320     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:              514
330     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             5353
340     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             5353
350     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:               68
360     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:               68
370     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:               67
380     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:               67
390     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             4500
400     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
```

```
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             4500
410     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:              500
420     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:              500
430     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             1812
440     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             1812
450     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             1813
460     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             1813
470     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             1645
480     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             1645
490     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             1646
500     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             1646
510     action:                             deny
        match.ip.hashlimit.burst:              2
        match.ip.hashlimit.expire:         30000
        match.ip.hashlimit.mode:          src-ip
        match.ip.hashlimit.name:          TCPRST
        match.ip.hashlimit.rate-above:     5/min
        match.ip.hashlimit.source-mask:       32
        match.ip.protocol:                    tcp
520     action:                             deny
        match.ip.hashlimit.burst:             30
        match.ip.hashlimit.expire:         30000
        match.ip.hashlimit.mode:          src-ip
        match.ip.hashlimit.name:       TCPGENRAL
        match.ip.hashlimit.rate-above: 50/second
        match.ip.hashlimit.source-mask:       32
        match.ip.protocol:                    tcp
530     action:                             deny
        match.ip.hashlimit.burst:             30
        match.ip.hashlimit.expire:          3000
        match.ip.hashlimit.mode:          src-ip
        match.ip.hashlimit.name:       TCPGENRAL
        match.ip.hashlimit.rate-above: 50/second
        match.ip.hashlimit.source-mask:       32
        match.ip.protocol:                    tcp
560     action:                           permit
        match.ip.protocol:                    udp
        match.ip.udp.dest-port:               161
        remark:                   Whitelist-snmp
570     action:                           permit
        match.ip.protocol:                    tcp
        match.ip.tcp.dest-port:               443
        remark:                  Whitelist-https
580     action:                           permit
        match.ip.protocol:                    tcp
        match.ip.tcp.dest-port:                22
        remark:                    Whitelist-ssh
590     action:                           permit
        match.ip.protocol:                    tcp
        match.ip.tcp.dest-port:              9339
        remark:                   Whitelist-gnmi
600     action:                           permit
        match.ip.protocol:                    tcp
        match.ip.tcp.dest-port:               636
        remark:               Whitelist-ldap-tls
610     action:                           permit
        match.ip.protocol:                    udp
        match.ip.udp.dest-port:               514
        remark:                Whitelist-rsyslog
```

```
    620     action:                          permit
            match.ip.protocol:                  tcp
            match.ip.tcp.dest-port:             389
            remark:                  Whitelist-ldap
    630     action:                          permit
            match.ip.protocol:                  tcp
            match.ip.tcp.dest-port:              49
            remark:                Whitelist-tacacs
    640     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:             123
            remark:                   Whitelist-ntp
    650     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:              53
            remark:                   Whitelist-dns
    660     action:                          permit
            match.ip.protocol:                  tcp
            match.ip.tcp.dest-port:              53
            remark:                   Whitelist-dns
    670     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            5353
            remark:                  Whitelist-mDNS
    680     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:              68
            remark:                  Whitelist-dhcp
    690     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:              67
            remark:                  Whitelist-dhcp
    700     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            4500
            remark:             Whitelist-IPSec-NAT
    710     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:             500
            remark:                   Whitelist-IKE
    720     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            1812
            remark:                Whitelist-radius
    730     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            1813
            remark:                Whitelist-radius
    740     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            1645
            remark:                Whitelist-radius
    750     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            1646
            remark:                Whitelist-radius
    760     action:                          permit
            match.ip.protocol:                 icmp
            remark:                  Whitelist-icmp
    770     action:                           log
            match.ip.hashlimit.burst:           5
            match.ip.hashlimit.expire:    4294967295
            match.ip.hashlimit.mode:         src-ip
            match.ip.hashlimit.name:        LOGGING
            match.ip.hashlimit.rate-above:    1/min
            match.ip.hashlimit.source-mask:    32
    780     action:                           deny
```

Run the `nv show acl ACL_MGMT_INBOUND_CP_DEFAULT --rev=applied -o json` command to show additional information, such as the connection state, hit count and update interval:

```
nvos@switch:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT --rev=applied -o json
...

"630": {
      "action": {
        "permit": {}
      },
      "match": {
        "ip": {
          "connection-state": {
            "established": {},
            "new": {}
          },
          "protocol": "tcp",
          "tcp": {
            "dest-port": {
              "49": {}
            }
          }
        }
      },
      "remark": "Whitelist-tacacs"
    },

...

"500": {
      "action": {
        "deny": {}
```

```
      },
      "match": {
        "ip": {
          "connection-state": {
            "new": {}
          },
          "protocol": "udp",
          "recent-list": {
            "action": "update",
            "hit-count": 100,
            "name": "UDP",
            "update-interval": 60
          },
          "udp": {
            "dest-port": {
              "1646": {}
            }
          }
        }
      }
...
```

To show information about a specific rule, run the `nv show acl <default-acl-id> rule <rule>` command:

```
nvos@switch:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 500
                        operational  applied
--------------------    -----------  -------
match
  ip
    protocol            udp          udp
    udp
      [dest-port]       1646         1646
    recent-list
      name              UDP          UDP
      update-interval   60           60
      hit-count         100          100
      action            update       update
action                  deny         deny

Run the nv show acl <default-acl-id> rule <rule> --rev=applied -o json command to see additional information, such
as the connection state:


nvos@switch:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 500 --rev=applied -o json {
  "action": {
    "deny": {}
  },
  "match": {
    "ip": {
      "connection-state": {
        "new": {}
      },
      "protocol": "udp",
      "recent-list": {
        "action": "update",
        "hit-count": 100,
        "name": "UDP",
        "update-interval": 60
      },
      "udp": {
        "dest-port": {
          "1646": {}
        }
      }
    }
  }
}
```

### 5.1.1.6 Log Messages

Default firewall rules include a log rule for packets that arrive in the control plane and do not match user defined or default firewall rules. The switch generates a log message in `/var/log/firewall_packet_capture.log` for packets that match the log rule.

The NVOS Linux default firewall rules protect the switch control plane and CPU from DOS and other potentially malicious network attacks.

The default set of firewall rules consists of IP and transport level rules. See Access Control List Configuration for custom ACL rules configurations.

### 5.1.1.7 DoS Rules

DoS rules protect the switch control plane and CPU from DOS attacks. NVOS provides firewall DoS rules to do the following:

- Allow only internal traffic to the loopback interfaces.
- Accept already established connections and outbound traffic.
- Drop packets if the first TCP segment is not SYN.
- Drop fragmented IP packets.
- Drop Christmas tree packets; packets with all TCP flags set.
- Drop NULL packets.
- Drop invalid packets.
- Drop strange MSS values.
- Provide brute-force protection.
- Drop packets with routing Header Type 0.
- Drop packets with a hop limit greater than 1.
- Limit excessive TCP reset packets.
- Protect against SYN flood.
- Rate limit new TCP connections for each IP address.
- Log all remaining packets, then drop them.

### 5.1.1.8 Whitelist Rules

Whitelist rules specify the services or application ports enabled on the switch. NVOS provides firewall whitelist rules to enable TCP ports and UDP ports.

The following table lists the ports that NVOS enables by default.

| Protocol | Port | Application |
|---|---|---|
| TCP | 22 | SSH |
| UDP | 68 | DHCP Client |
| UDP | 67 | DHCP Server |
| UDP | 123 | NTP |
| UDP | 161 | SNMP |
| TCP | 389 | LDAP |
| TCP | 636 | LDAP TLS |
| UDP | 546 | DHCPv6 Client |
| UDP | 547 | DHCPv6 Server |
| UDP | 4500 | IPSec-NAT |
| UDP | 500 | IKE |
| UDP | 1812,1813,1645,1656 | RADIUS |
| TCP | 49 | TACACS |
| UDP/TCP | 53 | DNS |
| UDP | 5353 | mDNS |

| Protocol | Port | Application |
|---|---|---|
| UDP | 514 | remote syslog |
| TCP | 443 | HTTPS |
| TCP | 9339 | gNMI |
| ICMP | NA | Ping |

### 5.1.1.9 Unset the Default Firewall Rules

To unset the default firewall rules to accept packets from all addresses and protocols:

```
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_INBOUND_CP_DEFAULT
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_INBOUND_CP_DEFAULT_IPV6
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_INBOUND_DEFAULT
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_INBOUND_DEFAULT_IPV6
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT
nvos@switch:~$ nv unset interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6
nvos@switch:~$ nv unset interface lo acl ACL_LOOPBACK_INBOUND_CP_DEFAULT
nvos@switch:~$ nv unset interface lo acl ACL_LOOPBACK_INBOUND_CP_DEFAULT_IPV6
nvos@switch:~$ nv config apply
```

To set the firewall rules back to the default setting:

```
nvos@switch:~$ nv unset interface
nvos@switch:~$ nv config apply
```

To set the firewall rules back to the default setting on speific interface:

```
nvos@switch:~$ nv unset interface eth0 acl
nvos@switch:~$ nv config apply
```

### 5.1.1.10 Add Firewall Rules

You cannot modify the `ACL_MGMT_INBOUND_CP_DEFAULT, ACL_MGMT_INBOUND_CP_DEFAULT_IPV6, ACL_MGMT_INBOUND_DEFAULT, ACL_MGMT_INBOUND_DEFAULT_IPV6, ACL_MGMT_OUTBOUND_CP_DEFAULT, ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6, ACL_LOOPBACK_INBOUND_CP_DEFAULT` and `ACL_LOOPBACK_INBOUND_CP_DEFAULT_IPV6` rules. However, you can append or insert additional rules.

If you use non-default ports for an application, NVIDIA recommends that you add a whitelist rule for the non-default port. For example, if you use ports 3020 and 3022 for radius server accounting and authentication instead of 1812 and 1813, you can add the following whitelist rules:

```
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 765 match ip udp source-port 3020
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 765 match ip connection-state new
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 765 match ip connection-state established
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 765 action permit
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 766 match ip udp source-port  3022
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 766 match ip connection-state new
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 766 match ip connection-state established
nvos@switch:~$ nv set acl ACL_MGMT_INBOUND_CP_DEFAULT rule 766 action permit
nvos@switch:~$ nv config apply
```

### 5.1.1.11 Show Firewall Rules

To show the default rules, run the `nv show acl <default-acl-id>` command, where `<default-acl-id>` is one of `ACL_MGMT_INBOUND_CP_DEFAULT, ACL_MGMT_INBOUND_CP_DEFAULT_IPV6, ACL_MGMT_INBOUND_DEFAULT, ACL_MGMT_INBOUND_DEFAULT_IPV6, ACL_MGMT_OUTBOUND_CP_DEFAULT, ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6, ACL_LOOPBACK_INBOUND_CP_DEFAULT` and `ACL_LOOPBACK_INBOUND_CP_DEFAULT_IPV6`:

```
nvos@switch:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT
      operational  applied
----  -----------  -------
type  ipv4         ipv4


rule
=======
    Number  Summary
    ------  ----------------------------------------
    10      action:                                deny
            match.ip.dest-ip:             127.0.0.0/8
    20      action:                            permit
    30      action:                              deny
            match.ip.protocol:                    tcp
    40      action:                              deny
            match.ip.protocol:                    tcp
    50      action:                              deny
            match.ip.protocol:                    tcp
    60      action:                              deny
            match.ip.protocol:                    tcp
    70      action:                              deny
    80      action:                              deny
            match.ip.protocol:                    tcp
    90      action:                              deny
            match.ip.protocol:                    tcp
    100     action:                              deny
    110     match.ip.protocol:                    tcp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            TCP
            match.ip.tcp.dest-port:                22
    120     action:                              deny
            match.ip.protocol:                    tcp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       100
            match.ip.recent-list.name:            TCP
            match.ip.recent-list.update-interval: 60
            match.ip.tcp.dest-port:                22
    130     match.ip.protocol:                    udp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            UDP
            match.ip.udp.dest-port:               161
    140     action:                              deny
            match.ip.protocol:                    udp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       100
            match.ip.recent-list.name:            UDP
            match.ip.recent-list.update-interval: 60
            match.ip.udp.dest-port:               161
    150     match.ip.protocol:                    tcp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            TCP
            match.ip.tcp.dest-port:               443
    160     action:                              deny
            match.ip.protocol:                    tcp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       150
            match.ip.recent-list.name:            TCP
            match.ip.recent-list.update-interval: 60
            match.ip.tcp.dest-port:               443
    170     match.ip.protocol:                    tcp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            TCP
            match.ip.tcp.dest-port:              9339
    180     action:                              deny
            match.ip.protocol:                    tcp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       100
            match.ip.recent-list.name:            TCP
            match.ip.recent-list.update-interval: 60
            match.ip.tcp.dest-port:              9339
    190     match.ip.protocol:                    tcp
            match.ip.recent-list.action:          set
            match.ip.recent-list.name:            TCP
            match.ip.tcp.dest-port:               636
    200     action:                              deny
            match.ip.protocol:                    tcp
            match.ip.recent-list.action:       update
            match.ip.recent-list.hit-count:       100
            match.ip.recent-list.name:            TCP
            match.ip.recent-list.update-interval: 60
            match.ip.tcp.dest-port:               636
    210     match.ip.protocol:                    tcp
```

```
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           TCP
        match.ip.tcp.dest-port:              389
220     action:                             deny
        match.ip.protocol:                   tcp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           TCP
        match.ip.recent-list.update-interval: 60
        match.ip.tcp.dest-port:              389
230     match.ip.protocol:                   tcp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           TCP
        match.ip.tcp.dest-port:               49
240     action:                             deny
        match.ip.protocol:                   tcp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           TCP
        match.ip.recent-list.update-interval: 60
        match.ip.tcp.dest-port:               49
250     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:              123
260     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:              123
270     match.ip.protocol:                   tcp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           TCP
        match.ip.tcp.dest-port:               53
280     action:                             deny
        match.ip.protocol:                   tcp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           TCP
        match.ip.recent-list.update-interval: 60
        match.ip.tcp.dest-port:               53
290     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:               53
300     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:               53
310     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:              514
320     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:              514
330     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             5353
340     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             5353
350     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:               68
360     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:               68
370     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:               67
380     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:               67
390     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             4500
400     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
```

```
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             4500
410     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:              500
420     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:              500
430     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             1812
440     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             1812
450     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             1813
460     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             1813
470     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             1645
480     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             1645
490     match.ip.protocol:                   udp
        match.ip.recent-list.action:         set
        match.ip.recent-list.name:           UDP
        match.ip.udp.dest-port:             1646
500     action:                             deny
        match.ip.protocol:                   udp
        match.ip.recent-list.action:      update
        match.ip.recent-list.hit-count:      100
        match.ip.recent-list.name:           UDP
        match.ip.recent-list.update-interval: 60
        match.ip.udp.dest-port:             1646
510     action:                             deny
        match.ip.hashlimit.burst:              2
        match.ip.hashlimit.expire:         30000
        match.ip.hashlimit.mode:          src-ip
        match.ip.hashlimit.name:          TCPRST
        match.ip.hashlimit.rate-above:     5/min
        match.ip.hashlimit.source-mask:       32
        match.ip.protocol:                    tcp
520     action:                             deny
        match.ip.hashlimit.burst:             30
        match.ip.hashlimit.expire:         30000
        match.ip.hashlimit.mode:          src-ip
        match.ip.hashlimit.name:       TCPGENRAL
        match.ip.hashlimit.rate-above: 50/second
        match.ip.hashlimit.source-mask:       32
        match.ip.protocol:                    tcp
530     action:                             deny
        match.ip.hashlimit.burst:             30
        match.ip.hashlimit.expire:          3000
        match.ip.hashlimit.mode:          src-ip
        match.ip.hashlimit.name:       TCPGENRAL
        match.ip.hashlimit.rate-above: 50/second
        match.ip.hashlimit.source-mask:       32
        match.ip.protocol:                    tcp
560     action:                           permit
        match.ip.protocol:                    udp
        match.ip.udp.dest-port:               161
        remark:                   Whitelist-snmp
570     action:                           permit
        match.ip.protocol:                    tcp
        match.ip.tcp.dest-port:               443
        remark:                  Whitelist-https
580     action:                           permit
        match.ip.protocol:                    tcp
        match.ip.tcp.dest-port:                22
        remark:                    Whitelist-ssh
590     action:                           permit
        match.ip.protocol:                    tcp
        match.ip.tcp.dest-port:              9339
        remark:                   Whitelist-gnmi
600     action:                           permit
        match.ip.protocol:                    tcp
        match.ip.tcp.dest-port:               636
        remark:               Whitelist-ldap-tls
610     action:                           permit
        match.ip.protocol:                    udp
        match.ip.udp.dest-port:               514
        remark:                Whitelist-rsyslog
```

```
    620     action:                          permit
            match.ip.protocol:                  tcp
            match.ip.tcp.dest-port:             389
            remark:                  Whitelist-ldap
    630     action:                          permit
            match.ip.protocol:                  tcp
            match.ip.tcp.dest-port:              49
            remark:                Whitelist-tacacs
    640     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:             123
            remark:                   Whitelist-ntp
    650     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:              53
            remark:                   Whitelist-dns
    660     action:                          permit
            match.ip.protocol:                  tcp
            match.ip.tcp.dest-port:              53
            remark:                   Whitelist-dns
    670     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            5353
            remark:                  Whitelist-mDNS
    680     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:              68
            remark:                  Whitelist-dhcp
    690     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:              67
            remark:                  Whitelist-dhcp
    700     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            4500
            remark:             Whitelist-IPSec-NAT
    710     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:             500
            remark:                   Whitelist-IKE
    720     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            1812
            remark:                Whitelist-radius
    730     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            1813
            remark:                Whitelist-radius
    740     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            1645
            remark:                Whitelist-radius
    750     action:                          permit
            match.ip.protocol:                  udp
            match.ip.udp.dest-port:            1646
            remark:                Whitelist-radius
    760     action:                          permit
            match.ip.protocol:                 icmp
            remark:                  Whitelist-icmp
    770     action:                           log
            match.ip.hashlimit.burst:           5
            match.ip.hashlimit.expire:    4294967295
            match.ip.hashlimit.mode:         src-ip
            match.ip.hashlimit.name:        LOGGING
            match.ip.hashlimit.rate-above:    1/min
            match.ip.hashlimit.source-mask:    32
    780     action:                           deny
```

Run the `nv show acl ACL_MGMT_INBOUND_CP_DEFAULT --rev=applied -o json` command to show additional information, such as the connection state, hit count and update interval:

```
nvos@switch:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT --rev=applied -o json
...

"630": {
      "action": {
        "permit": {}
      },
      "match": {
        "ip": {
          "connection-state": {
            "established": {},
            "new": {}
          },
          "protocol": "tcp",
          "tcp": {
            "dest-port": {
              "49": {}
            }
          }
        }
      },
      "remark": "Whitelist-tacacs"
    },

...

"500": {
      "action": {
        "deny": {}
```

```
      },
      "match": {
        "ip": {
          "connection-state": {
            "new": {}
          },
          "protocol": "udp",
          "recent-list": {
            "action": "update",
            "hit-count": 100,
            "name": "UDP",
            "update-interval": 60
          },
          "udp": {
            "dest-port": {
              "1646": {}
            }
          }
        }
      }
...
```

To show information about a specific rule, run the `nv show acl <default-acl-id> rule <rule>` c ommand:

```
nvos@switch:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 500
                        operational  applied
--------------------    -----------  -------
match
  ip
    protocol            udp          udp
    udp
      [dest-port]       1646         1646
    recent-list
      name              UDP          UDP
      update-interval   60           60
      hit-count         100          100
      action            update       update
action                  deny         deny

Run the nv show acl <default-acl-id> rule <rule> --rev=applied -o json command to see additional information, such
as the connection state:


nvos@switch:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 500 --rev=applied -o json {
  "action": {
    "deny": {}
  },
  "match": {
    "ip": {
      "connection-state": {
        "new": {}
      },
      "protocol": "udp",
      "recent-list": {
        "action": "update",
        "hit-count": 100,
        "name": "UDP",
        "update-interval": 60
      },
      "udp": {
        "dest-port": {
          "1646": {}
        }
      }
    }
  }
}
```

### 5.1.1.12 Log Messages

Default firewall rules include a log rule for packets that arrive in the control plane and do not match user defined or default firewall rules. The switch generates a log message in `/var/log/firewall_packet_capture.log` for packets that match the log rule.

## 5.1.2 Access Control List Configuration

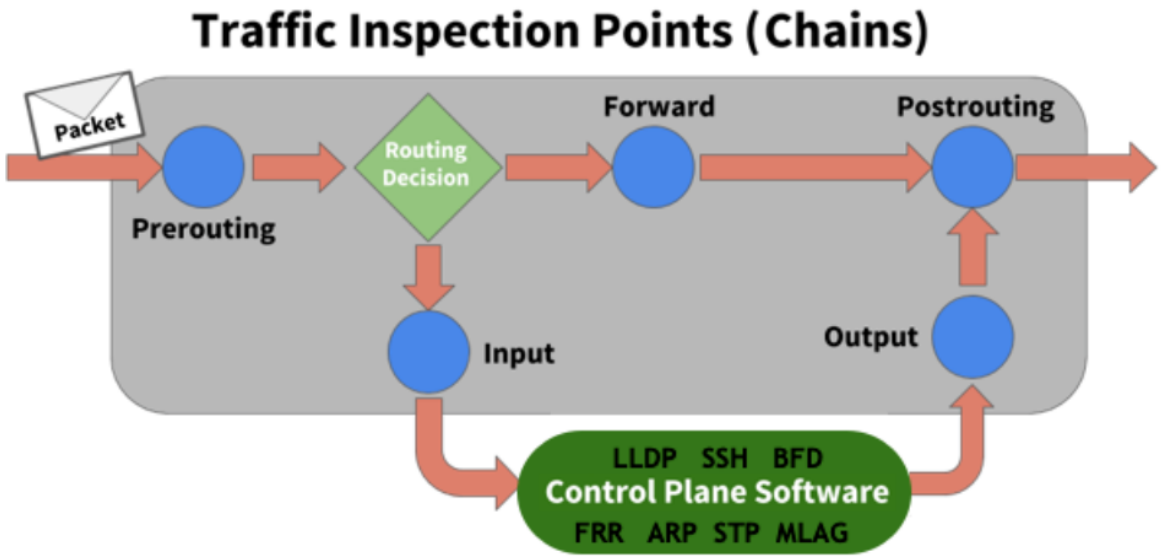
Recent-list LimiterNVOS Linux provides the NVUE, an NVOS Linux-specific userspace tool to configure custom ACLs on mgmt interfaces including 'eth0' and 'loopback' interfaces.

### 5.1.2.1 Traffic Rules

#### 5.1.2.1.1 Chains

ACLs in NVOS Linux classify and control packets to and from the switch, asserting policies at layers 3 and 4 of the Open Systems Interconnection (OSI) model by inspecting packet headers according to a list of rules.

The rules inspect or operate on packets at several points (*chains*) in the life of the packet through the system:

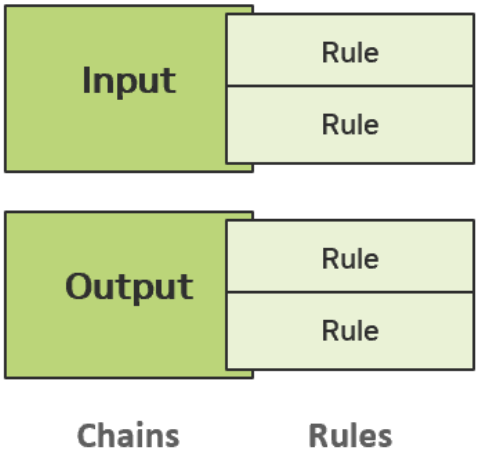



Supported chains are:

- PREROUTING touches packets before the switch routes them.
- INPUT touches packets after the switch determines that the packets are for the local system but before the control plane software receives them.
- OUTPUT touches packets from the control plane software before they leave the switch.
- POSTROUTING touches packets immediately before they leave the switch but after a routing decision.

#### 5.1.2.1.2 Rules

Rules classify the traffic you want to control. You apply rules to chains.




### 5.1.2.2 Install and Manage ACL Rules with NVUE

NVOS provides a comfortable way to manage ACL rules configurations on the system using NVUE.

Consider the following example, where we want to accept packets matching the following criteria:

1. TCP packets.
2. Source IP address— `10.0.14.2/32`
3. Any source port.
4. Destination IP address— `10.0.15.8/32`
5. Any destination port.

The steps we need to perform are:

1. Set the rule type, the matching protocol, source IP address and port, destination IP address and port, and the action. You must provide a name for the rule (EXAMPLE1 in the commands below):

```
admin@nvos:~$ nv set acl EXAMPLE1 type ipv4
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip protocol tcp
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip source-ip 10.0.14.2/32
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip tcp source-port ANY
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip dest-ip 10.0.15.8/32
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip tcp dest-port ANY
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 action permit
```

2. Apply the rule to an inbound or outbound interface with the `nv set interface <interface> acl` command.
   - For rules affecting the PREROUTING or POSTROUNTING chain, apply the rule to an inbound or outbound interface accordingly: For example:

```
admin@nvos:~$ nv set interface eth0 acl EXAMPLE1 inbound
admin@nvos:~$ nv config apply
```

   - For rules affecting the INPUT or OUPUT chain, apply the rule to inbound control plane or outbound control plane interface accordingly. For example:

```
admin@nvos:~$ nv set interface eth0 acl EXAMPLE1 inbound control-plane
```

```
admin@nvos:~$ nv config apply
```

> ⚠ If an ACL is not applied to an interface it will not take any effect during the process of a packet.

To see the configured rule run the NVUE `nv show acl <rule-name> rule <ID>` command:

```
admin@nvos:~$ nv show acl EXAMPLE1 rule 10
                    operational   applied
-------------------  ------------  ------------
match
  ip
    source-ip        10.0.14.2/32  10.0.14.2/32
    dest-ip          10.0.15.8/32  10.0.15.8/32
    protocol         tcp           tcp
    tcp
      [source-port]  ANY           ANY
      [dest-port]    ANY           ANY
```

To remove this rule, run the `nv unset acl <acl-name>` and `nv unset interface <interface> acl <acl-name>` commands.

```
admin@nvos:~$ nv unset acl EXAMPLE1
admin@nvos:~$ nv unset interface eth0 acl EXAMPLE1
admin@nvos:~$ nv config apply
```

To show ACL statistics per interface, such as the total number of bytes that match the ACL rule, run the `nv show interface <interface-id> acl <acl-id> statistics` or `nv show interface <interface-id> acl <acl-id> statistics <rule-id>` command, for example:

```
admin@nvos:~$ nv show interface eth0 acl EXAMPLE1 statistics
Rule  In Packet  In Byte  Out Packet  Out Byte  Layer  Remark  Action  Summary
----  ---------  -------  ----------  --------  -----  ------  ------  --------------------------------
10    0          0                              ip             permit  match.ip.dest-ip:   10.0.15.8/32
                                                                       match.ip.protocol:          tcp
                                                                       match.ip.source-ip: 10.0.14.2/32
                                                                       match.ip.tcp.dest-port:     ANY
                                                                       match.ip.tcp.source-port:   ANY
```

To see the list of all NVUE ACL commands, run the `nv list-commands acl` command.

#### 5.1.2.2.1 Rule Support

| Rule Element | Supported |
|---|---|
| **Matches** | Src/Dst, IP protocol<br>In/out interface<br>IPv4: ecn, icmp<br>IPv6: icmpv6, routing-header, extension-header<br>IP common: tcp (with flags), udp, multiport, frag, mss, connection-state |
| **Standard Actions** | permit, deny, log (log with log prefix), empty (no action specified) |
| **Limiters** | Recent-list<br>Hashlimit |

### 5.1.2.3 Default Action

The default action for each rule defined is no action. Packet matching such rules will not be affected and will continue to be processed by the proceeding rules in order.

### 5.1.2.4 Common Examples

#### 5.1.2.4.1 Control Plane Limiters

NVUE allows you to configure rate limit on traffic, so incoming packets drop if they exceed certain thresholds. NVUE provides two limiters to achieve it: recent-list and hashlimit.

##### 5.1.2.4.1.1 Recent-List Limiter

Allows you to dynamically create a list of IP addresses and then match against that list in a few different ways, for example:

```
admin@nvos:~$ nv set acl EXAMPLE2 type ipv4
admin@nvos:~$
admin@nvos:~$ nv set acl EXAMPLE2 rule 10 match ip tcp dest-port 22
admin@nvos:~$ nv set acl EXAMPLE2 rule 10 match ip protocol tcp
admin@nvos:~$ nv set acl EXAMPLE2 rule 10 match ip recent-list action set
admin@nvos:~$ nv set acl EXAMPLE2 rule 10 match ip recent-list name TCP-SSH-LIMIT
admin@nvos:~$
admin@nvos:~$ nv set acl EXAMPLE2 rule 20 match ip tcp dest-port 22
admin@nvos:~$ nv set acl EXAMPLE2 rule 20 match ip protocol tcp
admin@nvos:~$ nv set acl EXAMPLE2 rule 20 match ip recent-list action update
admin@nvos:~$ nv set acl EXAMPLE2 rule 20 match ip recent-list update-interval 60
admin@nvos:~$ nv set acl EXAMPLE2 rule 20 match ip recent-list hit-count 100
admin@nvos:~$ nv set acl EXAMPLE2 rule 20 match ip recent-list name TCP-SSH-LIMIT
admin@nvos:~$ nv set acl EXAMPLE2 rule 20 action deny
admin@nvos:~$
admin@nvos:~$ nv set interface eth0 acl EXAMPLE2 inbound control-plane
admin@nvos:~$ nv config apply
```

The above example, limits any source IP address sending more than 100 packets per 60-second interval to the switch, if it exceeds this rate all packets from this source IP address will be blocked.

> Configuring the recent-list limiter consists of two consecutive rules, both rules should contain the same matching criteria (protocol tcp and dest-port 22 in the above example) and the name of the recent-list (TCP-SSH-LIMIT in the above example).
>
> 1. The first rule is set to action 'set'
> 2. The second rule is set to recent-list action 'update' and specified with the requested threshold using 'hit-count' and 'update-interval' (100 packets per 60-second interval in the above example)
> 3. The second rule action is set to deny

##### 5.1.2.4.1.2 Hashlimit Limiter

Uses hash buckets to express a rate limiting match for a group of connections using a single rule. Grouping can be done per-hostgroup (source and/or destination address). It gives you the ability to express "*N*packets per time quantum per group", for example:

```
admin@nvos:~$ nv set acl EXAMPLE3 type ipv4
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 match ip tcp dest-port 22
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 match ip protocol tcp
```

```
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 match ip hashlimit name TCP-SSH-LIMIT
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 match ip hashlimit rate-above 5/min
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 match ip hashlimit burst 2
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 match ip hashlimit expire 3000
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 match ip hashlimit mode src-ip
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 match ip hashlimit source-mask 32
admin@nvos:~$ nv set acl EXAMPLE3 rule 10 action deny
admin@nvos:~$ nv set interface eth0 acl EXAMPLE2 inbound control-plane
admin@nvos:~$ nv config apply
```

The above example, limits any source IP address sending more than 5 packets per minute to the switch with a burst of 2 packets, if it exceeds this rate all packets from this source IP address will be blocked for 3000 milliseconds as specified in the expire parameter and will be able to send again after this period.

> ⚠ Configuring the recent-list limiter can be configured in one single ACL rule. The following parameters need to be configured for the hashlimit: name, rate-above, burst, expire and mode. The source-mask or destination-mask are optional.

### 5.1.2.4.2 Filter Specific TCP Flags

The example rule below drops ingress IPv4 TCP packets when you set the SYN bit and reset the RST, ACK, and FIN bits. The rule applies inbound on interface eth0. After configuring this rule, you cannot establish new TCP sessions that originate from ingress mgmt port eth0. You can establish TCP sessions that originate from any other port.

#### 5.1.2.4.2.1 NVUE Commands

```
admin@nvos:~$ nv set acl EXAMPLE4 type ipv4
admin@nvos:~$ nv set acl EXAMPLE4 rule 20 match ip protocol tcp
admin@nvos:~$ nv set acl EXAMPLE4 rule 20 match ip tcp flags syn
admin@nvos:~$ nv set acl EXAMPLE4 rule 20 match ip tcp mask rst
admin@nvos:~$ nv set acl EXAMPLE4 rule 20 match ip tcp mask syn
admin@nvos:~$ nv set acl EXAMPLE4 rule 20 match ip tcp mask fin
admin@nvos:~$ nv set acl EXAMPLE4 rule 20 match ip tcp mask ack
admin@nvos:~$ nv set acl EXAMPLE4 rule 20 action deny
admin@nvos:~$ nv set interface eth0 acl EXAMPLE4 inbound
admin@nvos:~$ nv config apply
```

### 5.1.2.4.3 Control Who Can SSH into the Switch

Run the following commands to control who can SSH into the switch. In the following example, 10.10.10.1/32 is the interface IP address (or loopback IP address) of the switch and 10.255.4.0/24 can SSH into the switch.

#### 5.1.2.4.3.1 NVUE Commands

```
admin@nvos:~$ nv set acl example2 type ipv4
admin@nvos:~$ nv set acl example2 rule 10 match ip source-ip 10.255.4.0/24
admin@nvos:~$ nv set acl example2 rule 10 match ip dest-ip 10.10.10.1/32
admin@nvos:~$ nv set acl example2 rule 10 action permit
admin@nvos:~$ nv set acl example2 rule 20 match ip source-ip ANY
admin@nvos:~$ nv set acl example2 rule 20 match ip dest-ip 10.10.10.1/32
admin@nvos:~$ nv set acl example2 rule 20 action deny
admin@nvos:~$ nv set interface eth0 acl example2 inbound
admin@nvos:~$ nv config apply
```

### 5.1.2.4.4 Match on ECN Bits in the TCP IP Header

ECN allows end-to-end notification of network congestion without dropping packets. You can add ECN rules to match on the ECE, CWR, and ECT flags in the TCP IPv4 header.

By default, ECN rules match a packet with the bit set. You can reverse the match by using an explanation point (!).

#### 5.1.2.4.4.1 Match on the ECE Bit

After an endpoint receives a packet with the CE bit set by a router, it sets the ECE bit in the returning ACK packet to notify the other endpoint that it needs to slow down.

To match on the ECE bit:

NVUE Commands

```
admin@nvos:~$ nv set acl example2 type ipv4
admin@nvos:~$ nv set acl example2 rule 10 match ip protocol tcp
admin@nvos:~$ nv set acl example2 rule 10 match ip ecn flags tcp-ece
admin@nvos:~$ nv set acl example2 rule 10 action permit
admin@nvos:~$ nv set interface eth0 acl example2 inbound
admin@nvos:~$ nv config apply
```

#### 5.1.2.4.4.2 Match on the CWR Bit

The CWR bit notifies the other endpoint of the connection that it received and reacted to an ECE.

To match on the CWR bit:

NVUE Commands

```
admin@nvos:~$ nv set acl example2 type ipv4
admin@nvos:~$ nv set acl example2 rule 10 match ip protocol tcp
admin@nvos:~$ nv set acl example2 rule 10 match ip ecn flags tcp-cwr
admin@nvos:~$ nv set acl example2 rule 10 action permit
admin@nvos:~$ nv set interface eth0 acl example2 inbound
admin@nvos:~$ nv config apply
```

#### 5.1.2.4.4.3 Match on the ECT Bit

The ECT codepoints negotiate if the connection is ECN capable by setting one of the two bits to 1. Routers also use the ECT bit to indicate that they are experiencing congestion by setting both the ECT codepoints to 1.

To match on the ECT bit:

NVUE Commands

```
admin@nvos:~$ nv set acl example2 type ipv4
admin@nvos:~$ nv set acl example2 rule 10 match ip protocol tcp
admin@nvos:~$ nv set acl example2 rule 10 match ip ecn ip-ect 1
admin@nvos:~$ nv set acl example2 rule 10 action permit
admin@nvos:~$ nv set interface eth0 acl example2 inbound
admin@nvos:~$ nv config apply
```

### 5.1.2.4.5 Set DSCP on Transit Traffic

The following examples use the *mangle* table to modify the packet as it transits the switch. DSCP is in decimal notation in the examples below.

To set SSH as high priority traffic:

```
admin@nvos:~$ nv set acl EXAMPLE1 type ipv4
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip protocol tcp
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip tcp dest-port 22
```

```
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 action set dscp 46
admin@nvos:~$ nv set interface eth0 acl EXAMPLE1 inbound
admin@nvos:~$ nv config apply
```

To set everything coming in swp1 as AF13:

```
admin@nvos:~$ nv set acl EXAMPLE1 type ipv4
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 action set dscp 14
admin@nvos:~$ nv set interface eth0 acl EXAMPLE1 inbound
admin@nvos:~$ nv config apply
```

To set Packets destined for 10.0.100.27 as best effort:

```
admin@nvos:~$ nv set acl EXAMPLE1 type ipv4
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip dest-ip 10.0.100.27/32
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 action set dscp 0
admin@nvos:~$ nv set interface eth0 acl EXAMPLE1 inbound
admin@nvos:~$ nv config apply
```

To use a range of ports for TCP traffic:

```
admin@nvos:~$ nv set acl EXAMPLE1 type ipv4
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip protocol tcp
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip source-ip 10.0.0.17/32
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip tcp source-port 10000:20000
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip dest-ip 10.0.100.27/32
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 match ip tcp dest-port 10000:20000
admin@nvos:~$ nv set acl EXAMPLE1 rule 10 action set dscp 34
admin@nvos:~$ nv set interface eth0 acl EXAMPLE1 inbound
admin@nvos:~$ nv config apply
```

> ⚠ To specify all ports on the switch in NVUE (swp+ in an iptables rule), you must set the range of interfaces on the switch as in the examples above ( `nv set interface swp1-48` ). This command creates as many rules in the `/etc/cumulus/acl/policy.d/50_nvue.rules` file as the number of interfaces in the range you specify.

## 5.1.3 Access Control List Commands


- 5.1.3.1 nv show acl
- 5.1.3.2 nv unset acl
- 5.1.3.3 nv show acl id
- 5.1.3.4 nv set/unset acl id
- 5.1.3.5 nv set/unset acl type
- 5.1.3.6 nv show acl rule
- 5.1.3.7 nv show acl rule id
- 5.1.3.8 nv set/unset acl rule
- 5.1.3.9 nv set/unset acl rule remark
- 5.1.3.10 nv show acl rule action
- 5.1.3.11 nv set/unset acl rule action permit
- 5.1.3.12 nv set/unset acl rule action deny
- 5.1.3.13 nv set/unset acl rule action log log-prefix
- 5.1.3.14 nv show acl rule match
- 5.1.3.15 nv set/unset acl rule match
- 5.1.3.16 nv show acl rule match ip
- 5.1.3.17 nv set/unset acl rule match ip
- 5.1.3.18 nv show acl rule match ip udp

- 5.1.3.19 nv show acl rule match ip udp dest-port
- 5.1.3.20 nv set/unset acl rule match ip udp dest-port
- 5.1.3.21 nv show acl rule match ip udp source-port
- 5.1.3.22 nv set/unset acl rule match ip udp source-port
- 5.1.3.23 nv show acl rule match ip tcp
- 5.1.3.24 nv show acl rule match ip tcp dest-port
- 5.1.3.25 nv set/unset acl rule match ip tcp dest-port
- 5.1.3.26 nv show acl rule match ip tcp source-port
- 5.1.3.27 nv set/unset acl rule match ip tcp source-port
- 5.1.3.28 nv show acl rule match ip tcp flags
- 5.1.3.29 nv set/unset acl rule match ip tcp flags
- 5.1.3.30 nv show acl rule match ip tcp mask
- 5.1.3.31 nv set/unset acl rule match ip tcp mask
- 5.1.3.32 nv set/unset acl rule match ip tcp mss
- 5.1.3.33 nv set/unset acl rule match ip tcp all-mss-except
- 5.1.3.34 nv set/unset acl rule match ip fragment
- 5.1.3.35 nv show acl rule match ip ecn
- 5.1.3.36 nv set/unset acl rule match ip ecn
- 5.1.3.37 nv set/unset acl rule match ip ecn ip-ect
- 5.1.3.38 nv set/unset acl rule match ip ecn flags
- 5.1.3.39 nv show acl rule match ip connection-state
- 5.1.3.40 nv set/unset acl rule match ip connection-state
- 5.1.3.41 nv show acl rule match ip extension-header
- 5.1.3.42 nv set/unset acl rule match ip extension-header type
- 5.1.3.43 nv show acl rule match ip routing-header
- 5.1.3.44 nv set/unset acl ACL rule match ip routing-header type
- 5.1.3.45 nv set/unset acl ACL rule match ip source-ip
- 5.1.3.46 nv set/unset acl ACL rule match ip dest-ip
- 5.1.3.47 nv set/unset acl rule match ip protocol
- 5.1.3.48 nv set/unset acl rule match ip icmp-type
- 5.1.3.49 nv set/unset acl rule match ip icmpv6-type
- 5.1.3.50 nv show acl rule match ip recent-list
- 5.1.3.51 nv set/unset acl rule match ip recent-list name
- 5.1.3.52 nv set/unset acl rule match ip recent-list action
- 5.1.3.53 nv set/unset acl rule match ip recent-list hit-count
- 5.1.3.54 nv set/unset acl rule match ip recent-list update-interval
- 5.1.3.55 nv show acl rule match ip hashlimit
- 5.1.3.56 nv set/unset acl rule match ip hashlimit name
- 5.1.3.57 nv set/unset acl rule match ip hashlimit rate-above
- 5.1.3.58 nv set/unset acl rule match ip hashlimit burst
- 5.1.3.59 nv set/unset acl rule match ip hashlimit expire
- 5.1.3.60 nv set/unset acl rule match ip hashlimit mode
- 5.1.3.61 nv set/unset acl rule match ip hashlimit destination-mask
- 5.1.3.62 nv set/unset acl rule match ip hashlimit source-mask
- 5.1.3.63 nv show interface acl
- 5.1.3.64 nv show interface acl id
- 5.1.3.65 nv show interface acl statistics

- 5.1.3.66 nv show interface acl statistics
- 5.1.3.67 nv show interface acl outbound
- 5.1.3.68 nv show interface acl outbound control-plane
- 5.1.3.69 nv show interface acl inbound
- 5.1.3.70 nv show interface acl inbound control-plane
- 5.1.3.71 nv set/unset interface acl inbound
- 5.1.3.72 nv set/unset interface acl inbound control-plane
- 5.1.3.73 nv set/unset interface acl outbound control-plane
- 5.1.3.74 nv set/unset interface acl outbound
- 5.1.3.75 nv action clear acl counters
- 5.1.3.76 nv set acl rule action set dscp


### 5.1.3.1 nv show acl

| | |
|---|---|
| | nv show acl<br>Display all available ACLs on the system. |
| Syntax Description | N/A |
| History | 25.02.2002 |
| Example | <br>admin@nvos:~$ nv show acl<br>ACL type Summary<br>--- --- ---<br>ACL1 ipv4 rule: 1<br>Test ipv4 rule: 2<br>rule: 3<br>rule: 4<br>...<br>ACL_MGMT_INBOUND_DEFAULT ipv6 rule: 10<br>rule: 20<br>rule: 30<br>rule: 40<br>...<br>custom ipv6 rule: 5 |
| REST API | GET https://<ip>/nvue_v1/acl |
| Related Commands | nv set acl |
| Notes | • By default, there are ACLs configured on the system as part of the default rules. The corresponding ACL names are as follows:<br>  • ACL_LOOPBACK_INBOUND_CP_DEFAULT—IPv4 default rules bound to the loopback interface in the inbound control-plane direction<br>  • ACL_LOOPBACK_INBOUND_CP_DEFAULT_IPV6—IPv6 default rules bound to the loopback interface in the inbound control-plane direction<br>  • ACL_MGMT_INBOUND_CP_DEFAULT—IPv4 default rules bound to the mgmt interface in the inbound control-plane direction<br>  • ACL_MGMT_INBOUND_CP_DEFAULT_IPV6—IPv6 default rules bound to the mgmt interface in the inbound control-plane direction<br>  • ACL_MGMT_INBOUND_DEFAULT—IPv4 default rules bound to the mgmt interface in the inbound direction<br>  • ACL_MGMT_INBOUND_DEFAULT_IPV6—IPv6 default rules bound to the mgmt interface in the inbound direction<br>  • ACL_MGMT_OUTBOUND_CP_DEFAULT— IPv4 default rules bound to the mgmt interface in the outbound control-plane direction<br>  • ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6—IPv6 default rules bound to the mgmt interface in the outbound control-plane direction<br>• Each ACL can have either IPv4 or IPv6. |

### 5.1.3.2 nv unset acl

| | |
|---|---|
| | nv unset acl<br>Clear all the new configured ACLs and restore the original default ACLs. |
| Syntax Description | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv unset acl` |
| REST API | DELETE https://<ip>/nvue_v1/acl |
| Related Commands | nv show acl |
| Notes | This command will remove the modifications/extra ACLs configured on the system and restore to the original default ACLs. |

### 5.1.3.3 nv show acl id

| | | |
|---|---|---|
| | nv show acl <acl-id><br>Get ACL <acl-id> information (i.e., rule-ids and the ACL type: ipv4 or ipv6). | |
| Syntax Description | acl-id | ACL name |
| History | 25.02.2002 | |
| Example | | |
| REST API | GET https://<ip>/nvue_v1/acl/<acl-id> | |
| Related Commands | nv show acl | |
| Notes | | |

```
admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_DEFAULT
      operational  applied
----  -----------  -------
type  ipv4         ipv4


rule
=======
    Number  Summary
    ------  -------------------------------------
    10      action:                          deny
            match.ip.protocol:                tcp
            match.ip.tcp.all-mss-except: 536-65535
```

### 5.1.3.4 nv set/unset acl id

| | | |
|---|---|---|
| | nv set acl <acl-id><br>nv unset acl <acl-id><br>Create a new custom ACL<br>Delete an existing ACL. | |
| Syntax Description | acl-id | New, custom ACL name |

| | |
|---|---|
| History | 25.02.2002 |
| Example | `admin@nvos:~$nv set acl EXAMPLE_ACL` |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/<acl-id> |
| Related Commands | nv show acl |
| Notes | • ACL name can be chosen to any generic name but is important later on binding multiple ACLs on the same interface and same direction since ACLs list of rules will be ordered with lexicographical order.<br>  • For example, ACL with name 'A' that has 10 rules and acl with name 'B' with 5 rules, if bound to the same direction on the same interface, the 10 rules of acl 'A' will be before the 5 rules of acl 'B'.<br>• This command is not enough for applying this custom acl, it needs to have at **least one rule** in it and needs to belong to the ip **type either ipv4 or ipv6.**<br>• The unset command will not remove the specified ACL if it is bound to an interface. The user must unbind it and then use this command to delete the ACL.<br>• Unset of default ACL will restore the original list of rules of that ACL. |

### 5.1.3.5 nv set/unset acl type

| | | |
|---|---|---|
| | nv set acl <acl-id> type <acl-type><br>nv unset acl <acl-id> type <acl-type><br>Add ACL type, whether it is an IPv4 or IPv6 ACL. | |
| Syntax Description | acl-id | New, custom ACL name |
| | acl-type | Enum: ipv4 \| ipv6 |
| History | 25.02.2002 | |
| Example | | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/<acl-id>/type/ | |
| Related Commands | nv show acl | |
| Notes | Each ACL must have a type | |

### 5.1.3.6 nv show acl rule

| | | |
|---|---|---|
| | nv show acl <acl-id> rule<br>Display all the rules configured on the specified ACL. | |
| Syntax Description | acl-id | ACL name |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule
Number  Summary
------  ----------------------------------------
1       action:                                log
10      action:                               deny
        match.ip.dest-ip:             127.0.0.0/8
20      action:                            permit
30      action:                               deny
        match.ip.protocol:                     tcp
40      action:                               deny
        match.ip.protocol:                     tcp
50      action:                               deny
        match.ip.protocol:                     tcp
60      action:                               deny
        match.ip.protocol:                     tcp
70      action:                               deny
80      action:                               deny
        match.ip.protocol:                     tcp
90      action:                               deny
        match.ip.protocol:                     tcp
100     action:                               deny
110     match.ip.protocol:                     tcp
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/acl/<acl-id>/rule |
| Related Commands | nv show acl <acl-id> |
| Notes | |

## 5.1.3.7 nv show acl rule id

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id><br>Show ACL rule <rule-id> configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 10
            operational  applied
-----------  -----------  -----------
match
  ip
    dest-ip  127.0.0.0/8  127.0.0.0/8
action       deny         deny
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id} |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

## 5.1.3.8 nv set/unset acl rule

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id><br>nv unset acl <acl-id> rule <rule-id><br>Set/remove ACL rule <rule-id> configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |

| | |
|---|---|
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv set acl user_custom_acl rule 10` |
| REST API | PATH https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id} |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | • This command is used to declare the specified rule with the specified ACL.<br>• Mere application of configuration is insufficient. Matching criteria on either the packet or action for this rule must be specified in order to be effective. |

### 5.1.3.9 nv set/unset acl rule remark

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> remark <string><br>nv unset acl <acl-id> rule <rule-id> remark <string><br>Set/remove ACL rule <rule-id> remark configurations (remark is the same as description). | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl user_custom_acl rule 20 remark "MY-PROTECTIVE-RULE"` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/action/deny | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | The remark acts the same as a description of a rule. | |

### 5.1.3.10 nv show acl rule action

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> action<br>Show ACL rule <rule-id> action configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 10 action`<br>`operational  applied`<br>`-----------  -------`<br>`deny  deny` | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/action | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | | |

### 5.1.3.11 nv set/unset acl rule action permit

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> action permit<br>nv unset acl <acl-id> rule <rule-id> action permit<br>Set/remove ACL rule <rule-id> action permit. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl user_custom_acl rule 10 action permit` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/action/permit | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Only one action per rule can be specified.<br>• Any rule matching the specified rule will be accepted to the system.<br>• Leaving a rule with no action will leave any packet matching the specified rule unaffected. | |

### 5.1.3.12 nv set/unset acl rule action deny

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> action deny<br>nv unset acl <acl-id> rule <rule-id> action deny<br>Set/remove ACL rule <rule-id> action deny. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl user_custom_acl rule 20 action deny` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/action/deny | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Only one action per rule can be specified.<br>• Any rule matching the specified rule will be rejected by the system and will be processed any further.<br>• Leaving a rule with no action will leave any packet matching the specified rule unaffected. | |

### 5.1.3.13 nv set/unset acl rule action log log-prefix

| | |
|---|---|
| | nv set acl <acl-id> rule <rule-id> action log log-prefix <str><br>nv unset acl <acl-id> rule <rule-id> action log log-prefix <str><br>Set/remove ACL rule <rule-id> action log log-prefix <str>. |

| | | |
|---|---|---|
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | log-prefix-str | String |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl user_custom_acl rule 20 action log<br><br>admin@nvos:~$ nv set acl user_custom_acl rule 30 action log log-prefix "Dropped-by-custom-acl" | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/action/log<br>PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/action/log/log-prefix/<log-prefix-str> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Only one action per rule can be specified.<br>• Log-prefix can be set to empty string.<br>• Any packet matching specified rule with logging action will be logged to netfilter log.<br>• Leaving a rule with no action will leave any packet matching the specified rule unaffected. | |

### 5.1.3.14 nv show acl rule match

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match<br>Show ACL rule <rule-id> match configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 10 match<br>operational applied<br>--------- ----------- -----------<br>ip<br>dest-ip 127.0.0.0/8 127.0.0.0/8 | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | Currently, displaying the matching criteria for the rule only contains layer 3 and 4 filtering criteria in the OSI model. | |

### 5.1.3.15 nv set/unset acl rule match

| | |
|---|---|
| | nv set acl <acl-id> rule <rule-id> match<br>nv unset acl <acl-id> rule <rule-id> match<br>Set/remove ACL rule <rule-id> match. |

| | | |
|---|---|---|
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl user_custom_acl rule 20 match | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Leaving a rule with empty matching criteria will cause the rule to match any packet.<br>• The unset form of the command will remove the match criteria of the rule. | |

### 5.1.3.16 nv show acl rule match ip

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip<br>Show ACL rule <rule-id> match IP configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 10 match ip<br>operational applied<br>--- --- ---<br>dest-ip 127.0.0.0/8 127.0.0.0/8 | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | Displays the matching IP criteria for the rule. | |

### 5.1.3.17 nv set/unset acl rule match ip

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip<br>nv unset acl <acl-id> rule <rule-id> match ip<br>Set/remove ACL rule <rule-id> match ip configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv unset acl user_custom_acl rule 20 match ip | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |

| | |
|---|---|
| Notes | • Leaving a rule with empty IP matching criteria will cause the rule to match any packet.<br>• The unset command will remove the IP match criteria of the rule. |

### 5.1.3.18 nv show acl rule match ip udp

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip udp<br>Show ACL rule <rule-id> match IP UDP configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 650 match ip udp<br>operational applied<br>---------- ---------- -------<br>[dest-port] 53 53 | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/udp | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Display the matching UDP IP criteria for the rule.<br>• The output primarily contains either the source port or destination port. | |

### 5.1.3.19 nv show acl rule match ip udp dest-port

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip udp dest-port<br>Show ACL rule <rule-id> match IP UDP dest-port configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show acl custom-acl rule 650 match ip udp dest-port<br>Ports<br>-----<br>53<br>22 | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/udp/dest-port | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • The command displays the matching dest-port of UDP IP criteria for the rule.<br>• The rule can have more than dest-port configured. | |

### 5.1.3.20 nv set/unset acl rule match ip udp dest-port

| | |
|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip udp dest-port <port-num><br>nv unset acl <acl-id> rule <rule-id> match ip udp dest-port <port-num><br>Configure/remove ACL rule <rule-id> match IP UDP dest-port <port-num> configurations. |

| | | |
|---|---|---|
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | port-num | IP port ID (integer: 0-65535 \| enum: ANY, bootpc, bootps, clag, dhcp-client, dhcp-server, domain, ftp, http, https, imap2, ldap, ldaps, ntp, msdp, pop3, smtp, snmp, snmp-trap, ssh, telnet, tftp \| ip-port-range) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl custom-acl rule 650 match ip udp dest-port 22<br>admin@nvos:~$ nv set acl custom-acl rule 650 match ip udp dest-port 53 | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/udp/dest-port/<port-num> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • The rule can have more than dest-port configured.<br>• Rule cannot be configured with more than one source port and more than one dest-port at the same time in the same rule. For example, the user cannot configure ports 22, 53 on the dest-port and 1813 on the source-port, but can configure 22 on dest-port and 1813 on source-port.<br>• The user can configure more than one port on dest-port or source-port. | |

### 5.1.3.21 nv show acl rule match ip udp source-port

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip udp source-port<br>Show ACL rule <rule-id> match IP UDP source-port configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show acl custom-acl rule 650 match ip udp source-port<br>Ports<br>-----<br>53<br>22 | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/udp/source-port | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Display the matching dest-port of UDP IP criteria for the rule.<br>• The rule can have more than dest-port configured. | |

### 5.1.3.22 nv set/unset acl rule match ip udp source-port

| | |
|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip udp source-port <port-num><br>nv unset acl <acl-id> rule <rule-id> match ip udp source-port <port-num><br>Configure/remove ACL rule <rule-id> match IP UDP source-port <port-num> configurations. |

| | | |
|---|---|---|
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | port-num | IP port ID (integer: 0-65535 \| enum:ANY, bootpc, bootps, clag, dhcp-client, dhcp-server, domain, ftp,http, https, imap2, ldap, ldaps, ntp, msdp, pop3, smtp,snmp, snmp-trap,ssh, telnet, tftp \| ip-port-range) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl custom-acl rule 650 match ip udp source-port 22<br>admin@nvos:~$ nv set acl custom-acl rule 650 match ip udp source-port 53 | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/udp/source-port/<port-num> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • The rule can have more than source-port configured.<br>• Rule cannot be configured with more than one source port and more than one dest-port at the same time in the same rule. For example, the user cannot configure ports 22, 53 on the dest-port and 1813 on the source-port, but can configure 22 on dest-port and 1813 on source-port.<br>• The user can configure more than one port on dest-port or source-port. | |

### 5.1.3.23 nv show acl rule match ip tcp

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip tcp<br>Show ACL rule <rule-id> match ip tcp configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 650 match ip tcp<br>operational applied<br>----------- ----------- -------<br>[dest-port] 53 53<br><br>admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_DEFAULT rule 10 match ip tcp<br>operational applied<br>-------------- ----------- ---------<br>all-mss-except 536-65535 536-65535 | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Display the matching UDP IP criteria for the rule.<br>• The output primarily contains any of the source-port, dest-port, flags, mask, mss, all-mss-except. | |

### 5.1.3.24 nv show acl rule match ip tcp dest-port

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip tcp dest-port<br>Show ACL rule <rule-id> match IP TCP dest-port configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv show acl custom-acl rule 650 match ip tcp dest-port`<br>`Ports`<br>`-----`<br>`53`<br>`22` | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/dest-port | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Display the matching dest-port of TCP IP criteria for the rule.<br>• The rule can have more than dest-port configured. | |

### 5.1.3.25 nv set/unset acl rule match ip tcp dest-port

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip tcp dest-port <port-num><br>nv unset acl <acl-id> rule <rule-id> match ip tcp dest-port <port-num><br>Configure/remove ACL rule <rule-id> match ip tcp dest-port <port-num> configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | port-num | IP port ID (integer: 0-65535 \| enum: ANY, bootpc, bootps, clag, dhcp-client, dhcp-server, domain, ftp,http, https, imap2, ldap, ldaps, ntp, msdp, pop3, smtp,snmp, snmp-trap,ssh, telnet, tftp \| ip-port-range) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 650 match ip tcp dest-port 22`<br>`admin@nvos:~$ nv set acl custom-acl rule 650 match ip tcp dest-port 53` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/dest-port/<port-num> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • The rule can have more than source-port configured.<br>• Rule cannot be configured with more than one source port and more than one dest-port at the same time in the same rule. For example, the user cannot configure ports 22, 53 on the dest-port and 1813 on the source-port, but can configure 22 on dest-port and 1813 on source-port.<br>• The user can configure more than one port on dest-port or source-port. | |

### 5.1.3.26 nv show acl rule match ip tcp source-port

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip tcp source-port<br>Show ACL rule <rule-id> match IP TCP source-port configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv show acl custom-acl rule 650 match ip tcp source-port`<br>`Ports`<br>`-----`<br>`53`<br>`22` | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/source-port | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Display the matching dest-port of UDP IP criteria for the rule.<br>• The rule can have more than the dest-port configured. | |

### 5.1.3.27 nv set/unset acl rule match ip tcp source-port

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip tcp source-port <port-num><br>nv unset acl <acl-id> rule <rule-id> match ip tcp source-port <port-num><br>Configure/remove ACL rule <rule-id> match ip tcp source-port <port-num> configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | port-num | IP port ID (integer: 0-65535 \| enum:ANY, bootpc, bootps, clag, dhcp-client, dhcp-server, domain, ftp,http, https, imap2, ldap, ldaps, ntp, msdp, pop3, smtp,snmp, snmp-trap,ssh, telnet, tftp \| ip-port-range) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 650 match ip tcp source-port 22`<br>`admin@nvos:~$ nv set acl custom-acl rule 650 match ip tcp source-port 53` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/source-port/<port-num> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • The rule can have more than source-port configured.<br>• Rule cannot be configured with more than one source port and more than one dest-port at the same time in the same rule. For example, the user cannot configure ports 22, 53 on the dest-port and 1813 on the source-port, but can configure 22 on dest-port and 1813 on source-port.<br>• The user can configure more than one port on dest-port or source-port. | |

### 5.1.3.28 nv show acl rule match ip tcp flags

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip tcp flags<br>Show ACL rule <rule-id> match ip tcp flags configuration. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 60 match ip tcp flags  -o json
{
  "none": {}
}
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/flags |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

### 5.1.3.29 nv set/unset acl rule match ip tcp flags

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip tcp flags (syn \| ack \| fin \| rst \| urg \| psh \| all \| none)<br>nv unset acl <acl-id> rule <rule-id> match ip tcp flags (syn \| ack \| fin \| rst \| urg \| psh \| all \| none)<br>Configure/remove ACL rule <rule-id> match ip tcp flags <flag-id> configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | flag-id | enum: (syn \| ack \| fin \| rst \| urg \| psh \| all \| none) |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set acl custom-acl rule 650 match ip tcp flags all
admin@nvos:~$ nv set acl custom-acl rule 660 match ip tcp flags urg
admin@nvos:~$ nv set acl custom-acl rule 660 match ip tcp flags psh
admin@nvos:~$ nv set acl custom-acl rule 660 match ip tcp flags syn
```

| | |
|---|---|
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/flags/<flag-id> |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | • The user can configure multiple flags that are not 'none' or 'all'.<br>• The flag configurations must come with TCP mask configurations. |

### 5.1.3.30 nv show acl rule match ip tcp mask

| | |
|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip tcp mask<br>ACL rule <rule-id> match IP TCP mask configuration. |

| | | |
|---|---|---|
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT rule 60 match ip tcp mask  -o json
{
  "ack": {},
  "fin": {},
  "rst": {},
  "syn": {}
}
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/mask |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

## 5.1.3.31 nv set/unset acl rule match ip tcp mask

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip tcp mask (syn \| ack \| fin \| rst \| urg \| psh \| all \| none)<br>nv unset acl <acl-id> rule <rule-id> match ip tcp mask (syn \| ack \| fin \| rst \| urg \| psh \| all \| none)<br>Configure/remove ACL rule <rule-id> match ip tcp mask <flag-id> configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | flag-id | enum: (syn \| ack \| fin \| rst \| urg \| psh \| all \| none) |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set acl custom-acl rule 650 match ip tcp mask all
admin@nvos:~$ nv set acl custom-acl rule 660 match ip tcp mask urg
admin@nvos:~$ nv set acl custom-acl rule 660 match ip tcp mask psh
admin@nvos:~$ nv set acl custom-acl rule 660 match ip tcp mask syn
```

| | |
|---|---|
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/flags/<flag-id> |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | • The user can configure multiple flags that are not 'none' or 'all'.<br>• The flag configurations must come with TCP mask configurations. |

## 5.1.3.32 nv set/unset acl rule match ip tcp mss

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip tcp mss <mss-format><br>nv unset acl <acl-id> rule <rule-id> match ip tcp mss <mss-format><br>Configure/remove ACL rule <rule-id> match ip tcp mss configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |

| | | |
|---|---|---|
| | mss-format | tcpmss value could be an integer or a range.<br>Examples: "0-1", "536-65535", "65000", "128" |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl custom-acl rule 650 match ip tcp mss 536<br>admin@nvos:~$ nv set acl custom-acl rule 660 match ip tcp mss 536-65535 | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/mss/<mss-format> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | The command will match TCP packets with the specified MSS values. | |

### 5.1.3.33 nv set/unset acl rule match ip tcp all-mss-except

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip tcp all-mss-except <mss-format><br>nv unset acl <acl-id> rule <rule-id> match ip tcp all-mss-except <mss-format><br>Configure/remove ACL rule <rule-id> match ip tcp all-mss-except configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | mss-format | tcpmss value could be an integer or a range.<br>Examples: "0-1", "536-65535", "65000", "128" |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl custom-acl rule 650 match ip tcp all-mss-except 536<br>admin@nvos:~$ nv set acl custom-acl rule 660 match ip tcp all-mss-except 536-65535 | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/tcp/all-mss-except/<mss-format> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | The command will match all TCP packets with MSS value different than the specified MSS values. | |

### 5.1.3.34 nv set/unset acl rule match ip fragment

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip fragment<br>nv unset acl <acl-id> rule <rule-id> match ip fragment<br>Configure/remove ACL rule <rule-id> match IP fragment configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl custom-acl rule 650 match ip fragment | |

| | |
|---|---|
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/fragment |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | Match fragmented packets. |

### 5.1.3.35 nv show acl rule match ip ecn

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip ecn<br>Configure/remove ACL rule <rule-id> match IP ECN configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$nv show acl b rule 1 match ip ecn<br>operational applied<br>------ ----------- -------<br>ip-ect 3 3 | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/ecn | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | | |

### 5.1.3.36 nv set/unset acl rule match ip ecn

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip ecn<br>nv unset acl <acl-id> rule <rule-id> match ip ecn<br>Configure/remove ACL rule <rule-id> match IP ECN configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv unset acl custom-acl rule 650 match ip ecn | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/ecn | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | | |

### 5.1.3.37 nv set/unset acl rule match ip ecn ip-ect

| | |
|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip ecn ip-ect <ip-ect-num><br>nv unset acl <acl-id> rule <rule-id> match ip ecn ip-ect <ip-ect-num><br>Configure/remove ACL rule <rule-id> match IP ECN ip-ect configurations. |

| | | |
|---|---|---|
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | ip-ect | ip-ect (integer: 0-3) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl custom-acl rule 650 match ip ecn ip-ect 0 | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/ecn/ip-ect | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | | |

### 5.1.3.38 nv set/unset acl rule match ip ecn flags

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip ecn flags <ecn-flag><br>nv unset acl <acl-id> rule <rule-id> match ip ecn flags <ecn-flag><br>Configure/remove ACL rule <rule-id> match IP ECN ip-ect configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | en-flag | enum: tcp-cwr \| tcp-ece |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl custom-acl rule 650 match ip ecn flags  tcp-cwr | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/ecn/flags/<flag-id> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | | |

### 5.1.3.39 nv show acl rule match ip connection-state

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip connection-state<br>Show ACL rule <rule-id> match IP connection-state configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show acl ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6 rule 10 match ip connection-state -o json<br>{<br>  "related": {},<br>  "new": {}<br>} | |

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/connection-state |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

### 5.1.3.40 nv set/unset acl rule match ip connection-state

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip connection-state <state-id><br>nv unset acl <acl-id> rule <rule-id> match ip connection-state <state-id><br>Configure/remove ACL rule <rule-id> match IP connection-state <state-id> configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | state-id | state-id can be: established, invalid, new, related |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip connection-state new` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/ecn/ip-ect | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | Multiple connection-states can be configured. | |

### 5.1.3.41 nv show acl rule match ip extension-header

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip extension-header<br>Show ACL rule <rule-id> match IP extension-header configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv show acl ACL1 rule 1 match ip extension-header`<br>`operational applied`<br>`---------- ---------- ----------`<br>`type hop-by-hop hop-by-hop` | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/extension-header | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | | |

### 5.1.3.42 nv set/unset acl rule match ip extension-header type

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip extension-header type <hop-by-hop><br>nv unset acl <acl-id> rule <rule-id> match ip extension-header type <hop-by-hop><br>Configure/remove ACL rule <rule-id> match IP extension-header configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set acl custom-acl rule 10 match ip extension-header type hop-by-hop | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/extension-header/type/<type> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • This configuration is relevant to IPv6 ACLs only.<br>• Matches '-m hbh' in ip6tables tool | |

### 5.1.3.43 nv show acl rule match ip routing-header

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip routing-header<br>Show ACL rule <rule-id> match ip routing-header configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT_IPV6 rule 850 match ip routing-header<br>operational applied<br>---- ---------- -------<br>type 0 0 | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/routing-header | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | | |

### 5.1.3.44 nv set/unset acl ACL rule match ip routing-header type

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip routing-header type <hop-by-hop><br>nv unset acl <acl-id> rule <rule-id> match ip routing-header type <hop-by-hop><br>Configure/remove ACL rule <rule-id> match ip routing-header configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip extension-header type 0` |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/routing-header/type/<type> |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | • This configuration is relevant to IPv6 ACLs only.<br>• Matches '-m rt' in ip6tables tool |

### 5.1.3.45 nv set/unset acl ACL rule match ip source-ip

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip source-ip <ip-format><br>nv unset acl <acl-id> rule <rule-id> match ip source-ip <ip-format><br>Configure/remove ACL rule <rule-id> match ip source-ip configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | source-ip | (ANY \| <ipv4> \| <ipv6> \| <ipv4-prefix> \| <ipv6-prefix> \| <ipv4-netmask> \| <ipv6-netmask>) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip source-ip 127.0.0.1/8` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/source-ip/<ip-format> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | The user cannot configure IPv4 address on an ACL with IPv6 and vice versa. | |

### 5.1.3.46 nv set/unset acl ACL rule match ip dest-ip

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip dest-ip <ip-format><br>nv unset acl <acl-id> rule <rule-id> match ip dest-ip <ip-format><br>Configure/remove ACL rule <rule-id> match ip dest-ip configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | dest-ip | (ANY \| <ipv4> \| <ipv6> \| <ipv4-prefix> \| <ipv6-prefix> \| <ipv4-netmask> \| <ipv6-netmask>) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip dest-ip 127.0.0.1/8` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/dest-ip/<ip-format> | |

| | |
|---|---|
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | The user cannot configure IPv4 address on an ACL with IPv6 and vice versa. |

### 5.1.3.47 nv set/unset acl rule match ip protocol

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip protocol <protocol-format><br>nv unset acl <acl-id> rule <rule-id> match ip protocol <protocol-format><br>Configure/remove ACL rule <rule-id> match IP dest-ip configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | protocol-format | (0-255 \| tcp \| udp \| icmp \| icmpv6) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip protocol tcp` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/protocol/<protocol-format> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | | |

### 5.1.3.48 nv set/unset acl rule match ip icmp-type

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip icmp-type <icmp-format><br>nv unset acl <acl-id> rule <rule-id> match ip icmp-type <icmp-format><br>Configure/remove ACL rule <rule-id> match IP ICMP-type configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | icmp-format | (0-255 \| echo-reply \| echo-request \| time-exceeded \| dest-unreachable \| port-unreachable) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip icmp-type echo-reply`<br>`admin@nvos:~$ nv set acl custom-acl rule 10 match ip icmp-type 9` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/icmp-type/<icmp-format> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |

| | |
|---|---|
| Notes | • The protocol must be specified to be ICMP<br>`$nv set acl custom-acl rule 10 match ip protocol icmp`<br>• IPv4 type must be specified for the configured ACL. |

## 5.1.3.49 nv set/unset acl rule match ip icmpv6-type

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip icmpv6-type <icmp-format><br>nv unset acl <acl-id> rule <rule-id> match ip icmpv6-type <icmp-format><br>Configure/remove ACL rule <rule-id> match IP ICMPv6-type configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | icmpv6-format | (0-255 \| router-solicitation \| router-advertisement \| neighbor-solicitation \| neighbor-advertisement) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip icmp-type router-solicitation`<br>`admin@nvos:~$ nv set acl custom-acl rule 10 match ip icmp-type 9` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/icmpv6-type/<icmpv6-format> | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • The protocol must be specified to be ICMPv6.<br>`$nv set acl custom-acl rule 10 match ip protocol icmpv6`<br>• IPv6 type must be specified for the configured ACL. | |

## 5.1.3.50 nv show acl rule match ip recent-list

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip recent-list<br>Show ACL rule <rule-id> match ip recent-list configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT_IPV6 rule 600 match ip recent-list`<br>`operational applied`<br>`--- --- ---`<br>`name UDP UDP`<br>`update-interval 60 60`<br>`hit-count 100 100`<br>`action update update` | |
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/recent-list | |

| | |
|---|---|
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | • Matches the 'recent' iptables module.<br>• Used to filter IP address that passes a specific rate.<br>In the above example, the rate is 100 packets per 60 seconds, if a source-ip sends more than this rate, the IP address will be blocked. |

### 5.1.3.51 nv set/unset acl rule match ip recent-list name

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip recent-list name <generic-name><br>nv unset acl <acl-id> rule <rule-id> match ip recent-list name <generic-name><br>Configure/remove ACL rule <rule-id> match IP recent-list name configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip recent-list name "EXAMPLE"` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/recent-list | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • In order to configure recent-list, the user needs to configure action and name for the recent-list<br>  • For action set: configure name and action=set<br>  • For action update: configure name and action=update, hit-count and update-interval<br>• There can be multiple recent-lists in the system and each is distinguished by a name.<br>• Refer to the documentation of 'recent' in 'iptables' for further information. | |

### 5.1.3.52 nv set/unset acl rule match ip recent-list action

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip recent-list action (set \| update)<br>nv unset acl <acl-id> rule <rule-id> match ip recent-list action (set \| update)<br>Configure/remove ACL rule <rule-id> match IP recent-list action configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip recent-list action update` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/recent-list | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |

| | |
|---|---|
| Notes | • In order to configure recent-list, the user needs to configure action and name for the recent-list<br>  • For action set: configure name and action=set<br>  • For action update: configure name and action=update, hit-count and update-interval<br>• There can be multiple recent-lists in the system and each is distinguished by a name.<br>• Refer to the documentation of 'recent' in 'iptables' for further information. |

### 5.1.3.53 nv set/unset acl rule match ip recent-list hit-count

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip recent-list hit-count (1-4294967295)<br>nv unset acl <acl-id> rule <rule-id> match ip recent-list hit-count (1-4294967295)<br>Configure/remove ACL rule <rule-id> match ip recent-list hit-count configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip recent-list hit-count 100` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/recent-list | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • In order to configure recent-list, the user needs to configure action and name for the recent-list<br>  • For action set: configure name and action=set<br>  • For action update: configure name and action=update, hit-count and update-interval<br>• There can be multiple recent-lists in the system and each is distinguished by a name.<br>• Refer to the documentation of 'recent' in 'iptables' for further information. | |

### 5.1.3.54 nv set/unset acl rule match ip recent-list update-interval

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip recent-list update-interval (1-4294967295)<br>nv unset acl <acl-id> rule <rule-id> match ip recent-list update-interval (1-4294967295)<br>Configure/remove ACL rule <rule-id> match ip recent-list update-interval configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip recent-list update-interval 60` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/recent-list | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |

| | |
|---|---|
| Notes | • In order to configure recent-list, the user needs to configure action and name for the recent-list<br>  • For action set: configure name and action=set<br>  • For action update: configure name and action=update, hit-count and update-interval<br>• There can be multiple recent-lists in the system and each is distinguished by a name.<br>• Refer to the documentation of 'recent' in 'iptables' for further information. |

## 5.1.3.55 nv show acl rule match ip hashlimit

| | | |
|---|---|---|
| | nv show acl <acl-id> rule <rule-id> match ip hashlimit<br>Show ACL rule <rule-id> match ip hashlimit configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show acl ACL_MGMT_INBOUND_CP_DEFAULT_IPV6 rule 870 match ip hashlimit
                operational  applied
-----------     -----------  ----------
name            LOGGING      LOGGING
rate-above      1/min        1/min
burst           5            5
source-mask     128          128
expire          4294967295   4294967295
mode            src-ip       src-ip
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/recent-list |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | • Matches the 'hashlimit' iptables module.<br>• This is another way to filter IP addresses.<br>• The following properties are required for configuration: name, rate-above, burst, expire, mode. |

## 5.1.3.56 nv set/unset acl rule match ip hashlimit name

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip hashlimit name <generic-name><br>nv unset acl <acl-id> rule <rule-id> match ip hashlimit name <generic-name><br>Configure/remove ACL rule <rule-id> match IP hashlimit name configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set acl custom-acl rule 10 match ip hashlimit name "Limiter"
```

| | |
|---|---|
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/hashlimit |
| Related Commands | nv set acl <acl-id> rule <rule-id> |

| | |
|---|---|
| Notes | • Matches the 'hashlimit' iptables module.<br>• The following properties are required for configuration: name, rate-above, burst, expire, mode. |

### 5.1.3.57 nv set/unset acl rule match ip hashlimit rate-above

| | | |
|---|---|---|
| | nv [un]set acl <acl-id> rule <rule-id> match ip hashlimit rate-above <rate-format><br>Configure/remove ACL rule <rule-id> match IP hashlimit rate configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | rate-format | Rate limit, should be in the following format: integer/time-unit where time-unit is one of [second \| min \| hour]. The max supported rate is 1000000/second |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip hashlimit rate 2/min` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/hashlimit | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Matches the 'hashlimit' iptables module.<br>• The following properties are required for configuration: name, rate-above, burst, expire, mode. | |

### 5.1.3.58 nv set/unset acl rule match ip hashlimit burst

| | | |
|---|---|---|
| | nv [un]set acl <acl-id> rule <rule-id> match ip hashlimit burst <burst-int><br>Configure/remove ACL rule <rule-id> match IP hashlimit burst configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | burst-int | integer:1-4294967295 |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip hashlimit burst 5` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/hashlimit | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Matches the 'hashlimit' iptables module.<br>• The following properties are required for configuration: name, rate-above, burst, expire, mode. | |

### 5.1.3.59 nv set/unset acl rule match ip hashlimit expire

| | | |
|---|---|---|
| | nv [un]set acl <acl-id> rule <rule-id> match ip hashlimit expire <expire-int><br>Configure/remove ACL rule <rule-id> match IP hashlimit expire configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | expire-int | integer:1-4294967295 |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip hashlimit expire 3` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/hashlimit | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Matches the 'hashlimit' iptables module.<br>• The following properties are required for configuration: name, rate-above, burst, expire, mode. | |

### 5.1.3.60 nv set/unset acl rule match ip hashlimit mode

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip hashlimit mode <mode><br>nv unset acl <acl-id> rule <rule-id> match ip hashlimit mode <mode><br>Configure/remove ACL rule <rule-id> match IP hashlimit mode configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | mode | (enum:src-ip, dst-ip \| string) |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip hashlimit mode src-ip` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/hashlimit | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Matches the 'hashlimit' iptables module.<br>• The following properties are required for configuration: name, rate-above, burst, expire, mode. | |

### 5.1.3.61 nv set/unset acl rule match ip hashlimit destination-mask

| | |
|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip hashlimit destination-mask <mask><br>nv unset acl <acl-id> rule <rule-id> match ip hashlimit destination-mask <mask><br>Configure/remove ACL rule <rule-id> match IP hashlimit destination-mask configurations. |

| | | |
|---|---|---|
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | mask | integer: for ipv4 the range is 0-32 and for ipv6 the range is 0-128 |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip hashlimit destination-mask 32` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/hashlimit | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Matches the 'hashlimit' iptables module.<br>• The following properties are required for configuration: name, rate-above, burst, expire, mode. | |

### 5.1.3.62 nv set/unset acl rule match ip hashlimit source-mask

| | | |
|---|---|---|
| | nv set acl <acl-id> rule <rule-id> match ip hashlimit source-mask <mask><br>nv unset acl <acl-id> rule <rule-id> match ip hashlimit source-mask <mask><br>Configure/remove ACL rule <rule-id> match ip hashlimit source-mask configurations. | |
| Syntax Description | acl-id | ACL name |
| | rule-id | Rule number (integer: 1-65535) |
| | mask | Integer:<br>IPv4 range: 0-32<br>IPv6 range: 0-128 |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set acl custom-acl rule 10 match ip hashlimit source-mask 32` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/match/ip/hashlimit | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | • Matches the 'hashlimit' iptables module.<br>• The following properties are required for configuration: name, rate-above, burst, expire, mode. | |

### 5.1.3.63 nv show interface acl

| | | |
|---|---|---|
| | nv show interface <iface-id> acl<br>Display the acl bound to the interface. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show interface eth0 acl
ACL Name                          Rule ID  In Packets  In Bytes  Out Packets  Out Bytes
--------------------------------  -------  ----------  --------  -----------  ---------
ACL_MGMT_INBOUND_CP_DEFAULT       1        15620       2481722
                                  10       0           0
                                  20       14437       1118906
                                  30       0           0
...
                                  740      0           0
                                  750      0           0
                                  760      28          2352
                                  770      0           0
                                  780      0           0
ACL_MGMT_INBOUND_CP_DEFAULT_IPV6  10       0           0
                                  20       0           0
                                  30       0           0
...
                                  800      0           0
                                  810      0           0
                                  820      0           0
                                  830      0           0
                                  840      0           0
                                  850      0           0
                                  860      0           0
                                  870      0           0
                                  880      0           0
ACL_MGMT_INBOUND_DEFAULT          10       5           296
ACL_MGMT_INBOUND_DEFAULT_IPV6     10       0           0
ACL_MGMT_OUTBOUND_CP_DEFAULT      10                               0            0
                                  20                               9750         1885408
ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6 10                               45           4680
                                  20                               160          13308
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/acl |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

## 5.1.3.64 nv show interface acl id

| | | |
|---|---|---|
| | nv show interface <iface-id> acl <acl-id><br>Display the given acl-id bound to the interface. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT
Statistics
=============
    Rule  In Packet  In Byte  Out Packet  Out Byte  Layer  Remark  Action  Summary
    ----  ---------  -------  ----------  --------  -----  ------  ------  -------
    10                        0           0         ip             deny
    20                        9767        1902332                  permit
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id} |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

## 5.1.3.65 nv show interface acl statistics

| | |
|---|---|
| | nv show interface <iface-id> acl <acl-id> statistics<br>Display the given acl-id statistics bound to the interface. |

| | | |
|---|---|---|
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT statistics

Rule  In Packet  In Byte  Out Packet  Out Byte  Layer  Remark  Action  Summary
----  ---------  -------  ----------  --------  -----  ------  ------  -------
10                        0           0         ip             deny
20                        9767        1902332                  permit
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/statistics |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

## 5.1.3.66 nv show interface acl statistics

| | | |
|---|---|---|
| | nv show interface <iface-id> acl <acl-id> statistics <rule-id><br>Display the given acl-id statistics bound to the interface. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 acl  ACL_MGMT_INBOUND_DEFAULT statistics 10
                      operational  applied
--------------------  -----------  -------
match
  ip
    protocol          tcp
    tcp
      all-mss-except  536-65535
action                deny
inbound
  packet              5
  byte                296
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/statistics/{rule-id} |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

## 5.1.3.67 nv show interface acl outbound

| | | |
|---|---|---|
| | nv show interface <iface-id> acl <acl-id> outbound<br>Display the given acl-id bound to the interface in the outbound direction. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT outbound
Statistics
=============
No Data
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/outbound |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | If an ACL is configured on one direction and not the other, it will be shown in the parent show (nv show interface <iface> acl <acl-id>) and not in the show of the direction it is not configured on. |

## 5.1.3.68 nv show interface acl outbound control-plane

| | | |
|---|---|---|
| | nv show interface <iface-id> acl <acl-id> outbound control-plane<br>Display the given acl-id bound to the interface in the outbound control-plane direction. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT outbound control-plane
Statistics
=============
    Rule  In Packet  In Byte  Out Packet  Out Byte  Layer  Remark  Action  Summary
    ----  ---------  -------  ----------  --------  -----  ------  ------  -------
    10                        0           0         ip             deny
    20                        9823        1908964                  permit
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/outbound/control-plane |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | If an ACL is configured on one direction and not the other, it will be shown in the parent show (nv show interface <iface> acl <acl-id>) and not in the show of the direction it is not configured on. |

## 5.1.3.69 nv show interface acl inbound

| | | |
|---|---|---|
| | nv show interface <iface-id> acl <acl-id> inbound<br>Display the given acl-id bound to the interface in the inbound direction. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 acl ACL_MGMT_OUTBOUND_CP_DEFAULT inbound
Statistics
=============
    Rule  In Packet  In Byte  Out Packet  Out Byte  Layer  Remark  Action  Summary
    ----  ---------  -------  ----------  --------  -----  ------  ------
-------------------------------------
    10    5          296                            ip             deny    match.ip.protocol:
tcp
                                                                           match.ip.tcp.all-mss-
except: 536-65535
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/inbound |
| Related Commands | nv set acl <acl-id> rule <rule-id> |

| | |
|---|---|
| Notes | If an ACL is configured on one direction and not the other, it will be shown in the parent show (nv show interface <iface> acl <acl-id>) and not in the show of the direction it is not configured on. |

## 5.1.3.70 nv show interface acl inbound control-plane

| | | |
|---|---|---|
| | nv show interface <iface-id> acl <acl-id><br>Display the given acl-id bound to the interface in the inbound direction. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show interface eth0 acl AAA inbound control-plane<br>Statistics<br>==========<br>Rule In Packet In Byte Out Packet Out Byte Layer Remark Action Summary<br>---- --------- ------- ---------- -------- ----- ------ ------<br>----------<br>10 5 296 ip deny match.ip.protocol: tcp<br>match.ip.tcp.all-mss-except: 536-65535 | |
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/inbound/control-plane | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | If an ACL is configured on one direction and not the other, it will be shown in the parent show (nv show interface <iface> acl <acl-id>) and not in the show of the direction it is not configured on. | |

## 5.1.3.71 nv set/unset interface acl inbound

| | | |
|---|---|---|
| | nv set interface <iface-id> acl <acl-id> inbound<br>nv unset interface <iface-id> acl <acl-id> inbound<br>Configure/remove the binding of the given ACL on the specified interface. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| | acl-id | ACL name |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set interface eth0 acl ACL1 inbound | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/inboun | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | An ACL cannot be bound to inbound and inbound control-plane or cannot be bound to outbound and outbound control-plane on the same interface! | |

### 5.1.3.72 nv set/unset interface acl inbound control-plane

| | | |
|---|---|---|
| | nv set interface <iface-id> acl <acl-id> inbound control-plane<br>nv unset interface <iface-id> acl <acl-id> inbound control-plane<br>Configure/remove the binding of the given ACL on the specified interface. | |
| Syntax Description | iface-id | interface could be one of 'eth0' or 'loopback' |
| | acl-id | ACL name |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 acl ACL1 inbound control-plane` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/inbound/control-plane | |
| | nv set acl <acl-id> rule <rule-id> | |
| Notes | An ACL cannot be bound to inbound and inbound control-plane or cannot be bound to outbound and outbound control-plane on the same interface! | |

### 5.1.3.73 nv set/unset interface acl outbound control-plane

| | | |
|---|---|---|
| | nv set interface <iface-id> acl <acl-id> inbound control-plane<br>nv unset interface <iface-id> acl <acl-id> inbound control-plane<br>Configure/remove the binding of the given ACL on the specified interface. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| | acl-id | ACL name |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 acl ACL1 outbound control-plane` | |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/outbound/control-plane | |
| Related Commands | nv set acl <acl-id> rule <rule-id> | |
| Notes | An ACL cannot be bound to inbound and inbound control-plane or cannot be bound to outbound and outbound control-plane on the same interface! | |

### 5.1.3.74 nv set/unset interface acl outbound

| | | |
|---|---|---|
| | nv set interface <iface-id> acl <acl-id> outbound<br>nv unset interface <iface-id> acl <acl-id> outbound<br>Configure/remove the binding of the given ACL on the specified interface. | |
| Syntax Description | iface-id | Interface could be one of 'eth0' or 'loopback' |
| | acl-id | ACL name |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv set interface eth0 acl ACL1 outbound` |
| REST API | PATCH/DELETE https://<ip>/nvue_v1/interface/{interface-id}/acl/{acl-id}/outbound |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | An ACL cannot be bound to inbound and inbound control-plane or cannot be bound to outbound and outbound control-plane on the same interface! |

### 5.1.3.75 nv action clear acl counters

| | |
|---|---|
| | nv action clear acl counters<br>Clear the ACL counters in the show command. |
| Syntax Description | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv action clear acl counters` |
| REST API | POST https://<ip>/nvue_v1/acl |
| Related Commands | nv set acl <acl-id> rule <rule-id> |
| Notes | |

### 5.1.3.76 nv set acl rule action set dscp

| | | |
|---|---|---|
| | nv set acl rule action set dscp<br>Set DSCP value for packets. | |
| Syntax Description | acl-id | ACL ID to manipulate |
| | rule-id | Rule to configure dscp |

| | | |
|---|---|---|
| | Dscp-value | It could be enum or an integer.<br>Enums supported:<br>• af11<br>• af12<br>• af13<br>• af21<br>• af22<br>• af23<br>• af31<br>• af32<br>• af33<br>• af41<br>• af42<br>• af43<br>• cs1<br>• cs2<br>• cs3<br>• cs4<br>• cs5<br>• cs6<br>• cs7<br>• be<br>• ef<br>Or an integer in the range [0,63] |
| History | 25.02.4002 | |
| Example | admin@nvos:~$ nv set acl ACL1 rule 10 action set dscp ef | |
| REST API | PATCH https://<ip>/nvue_v1/acl/{acl-id}/rule/{rule-id}/action/set | |
| Related Commands | nv show acl rule action | |
| Notes | Supported only for the management interface.<br>Configurable only in inbound and outbound directions! | |

## 5.2 Attestation

For more information, see the following sections:

- TPM

### 5.2.1 TPM

TPM (Trusted Platform Module) is a hardware-based security technology that protects system integrity by securely storing cryptographic keys and measurements. It supports functionalities such as secure boot, attestation, and encryption.

#### 5.2.1.1 TPM Commands

- TPM Commands

## 5.2.1.2 TPM Commands


- 5.2.1.2.1 nv action generate system security tpm
- 5.2.1.2.2 nv action upload system security tpm
- 5.2.1.2.3 nv show system security tpm oiak
- 5.2.1.2.4 nv action import system security tpm oiak
- 5.2.1.2.5 nv action delete system security tpm oiak


### 5.2.1.2.1 nv action generate system security tpm

| | | |
|---|---|---|
| | nv action generate system security tpm <pcrs> <nonce> [algorithm]<br>Generate quotes file. | |
| Syntax Description | pcrs | Platform Configuration Registers to be included in the quote <1-30>, divided by “,”. Both quote and PCRs use the same hash algorithm. |
| | nonce | Hex string, up to 512 bits (128 hex letters) |
| | algorithm | Hashing algorithm to be used (e.g., sha384) |
| Default | Algorithm-sha384 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action generate system security tpm 1,2 12 algorithm sha384` | |
| REST API | POST https://<ip>/nvue_v1/system/security/tpm/quote | |
| Related Commands | | |
| Notes | | |

### 5.2.1.2.2 nv action upload system security tpm

| | | |
|---|---|---|
| | nv action upload sys security tpm <file-name> <remote-url><br>Upload configuration file. | |
| Syntax Description | file-name | File to be uploaded (IAK.crt, quotes.json, or oIAK.crt).<br>Note: quotes.json is a Base64-encoded JSON of quote.bin and signature, available after generating using nv action generate system security tpm. |
| | remote-url | Destination image file name<br>Remote url path to upload a file to.<br>Format: [protocol]://username[:password]@hostname/path/filename<br>Supported protocols: SCP, FTP, SFTP, and HTTPS |
| Default | N/A | |
| History | 25.02.2002<br>25.02.4002 Added HTTPS support in remote-url | |
| Example | `admin@nvos:~$ nv action upload sys security tpm IAK.crt scp://user:pass@host/path/IAK.crt` | |

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/security/tpm/upload |
| Related Commands | |
| Notes | |

### 5.2.1.2.3 nv show system security tpm oiak

| | | |
|---|---|---|
| | nv show sys security tpm oiak<br>Display owner IAK certificate. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.4257 | |
| Example | admin@nvos:~$ nv show sys security tpm oiak<br><br>operational<br>----- -----------<br>plain Certificate:<br>Data:<br>Version: 3 (0x2)<br>…<br>… | |
| REST API | GET https://<ip>/nvue_v1/system/security/tpm/oiak | |
| Related Commands | nv action import system security tpm oiak | |
| Notes | | |

### 5.2.1.2.4 nv action import system security tpm oiak

| | | |
|---|---|---|
| | nv action import system security tpm oiak<br>Import system security TPM owner IAK. | |
| Syntax Description | remote-url | A local/remote URI from where the certificate file (containing the public-key) can be retrievied |
| | data | The raw data bytes (e.g., PEM string) of the certificate |
| Default | N/A | |
| History | 25.02.4257 | |
| Example | admin@nvos:~$ nv action import system security tpm oiak remote-url scp://u:p@s/oIAK.crt | |
| REST API | POST https://<ip>/nvue_v1/system/security/tpm/oiak | |
| Related Commands | nv action delete system security tpm oiak<br>nv show sys security tpm oiak | |
| Notes | | |

### 5.2.1.2.5 nv action delete system security tpm oiak

| | |
|---|---|
| | nv action delete system security tpm oiak<br>Delete system security TPM owner IAK. |

| | | |
|---|---|---|
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.4257 | |
| Example | admin@nvos:~$ nv action delete system security tpm oiak | |
| REST API | DELETE https://<ip>/nvue_v1/system/security/tpm/oiak | |
| Related Commands | nv action import system security tpm oiak | |
| Notes | | |

## 5.3 Authentication Authorization and Accounting

AAA (authentication, authorization, and accounting) supports configuring local accounts and remote servers using protocols like RADIUS, TACACS+, and LDAP. The AAA object model includes user management, general configurations, and per-protocol settings.

AAA configuration can be viewed on NVOS.

```
admin@nvos:~$ nv show system aaa
```

AAA authentication consists of authentication order and authentication failthrough.

### 5.3.1 Authentication Order

Authentication order specifies the sequence of protocols (radius, tacacs, ldap, local) used for authentication, separated by commas, for example:

```
admin@nvos:~$ nv set system aaa authentication order radius,local
# or
admin@nvos:~$ nv set system aaa authentication order local,ldap
```

Authentication order must include local and one of the following: radius, tacacs, or ldap.

### 5.3.2 Authentication Failthrough

Authentication failthrough defines the behavior of authentication when it is rejected locally or by an AAA server.
When authentication failthrough is disabled (default), the authentication process is blocked if the user password is rejected either locally or by the AAA server.
When authentication failthrough is enabled, the authentication process continues to the next AAA server or method if it is rejected.

```
admin@nvos:~$ nv set system aaa authentication failthrough ?

    <arg>                   Configure failthrough.
                            "Enabled" login authentication continues to the next option on both server and
authentication errors.
                            "Disabled" login authentication continues only on server errors.
```

```
(enum:enabled, disabled | string | default:disabled)
```

> Authentication failthrough does not impact behavior when the AAA server is unavailable. After a server timeout, the switch will try the next server or method in order.

For more information on Authentication Authorization and Accounting, see the following sections:

- User Accounts
- LDAP Authentication and Authorization
- TACACS
- RADIUS
- Role Based Access Control
- Authorization

## 5.3.3 User Accounts


- 5.3.3.1 First Login
- 5.3.3.2 Reset Local Users' Passwords
- 5.3.3.3 User Account Commands


By default, NVOS has two user accounts: *admin* and *monitor*.

The *admin* account:

- The default password of the account is "admin".
- The system administrator account. It is part of *sudo* group and it has sudo privileges.
- The account has permissions to run any show, set or action commands.

The *monitor* account:

- The default password of the account is "monitor".
- The system monitor account. It has read-only privileges.
- The account has permissions to run show commands only.

### 5.3.3.1 First Login

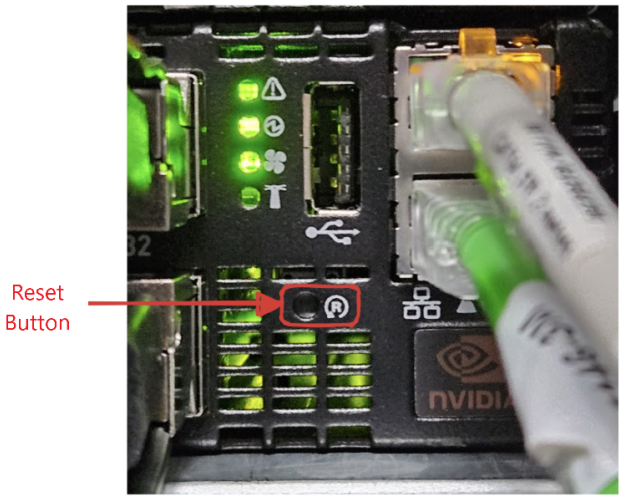
User will be required to change the default passwords for admin and monitor accounts upon first login. The new password must comply with the default password hardening rules (see Password Hardening section).
The new configured password is treated like any other configuration. If the configuration is not saved, the user will need to reconfigure it upon the system's next boot.

```
You are required to change your password immediately (administrator enforced).




WARNING: Your password has expired.
You must change your password now!
New password:
Retype new password:
```

### 5.3.3.2 Reset Local Users' Passwords

If the passwords for the local user accounts on the switch are forgotten, a recovery method exists. Press and hold the Reset button for at least 15 seconds to reset the passwords for the 'admin' and 'monitor' accounts. This process also deletes any non-default users (i.e., users other than 'admin' and 'monitor'), resets the passwords for these default users, and expires them. The expiration forces a password change upon the first login.

Reset Button on the Physical Switch




> The image is for illustration purposes only. The button's location may vary depending on the switch model.

### 5.3.3.3 User Account Commands

- User Account Commands

### 5.3.3.4 User Account Commands


- 5.3.3.4.1 nv show system aaa user
- 5.3.3.4.2 nv show system aaa user id
- 5.3.3.4.3 nv show system aaa user ssh authorized-key
- 5.3.3.4.4 nv show system aaa user ssh authorized-key id
- 5.3.3.4.5 nv show system aaa user ssh
- 5.3.3.4.6 nv show system aaa allow-reset-local-passwords
- 5.3.3.4.7 nv show system aaa user spiffe-id
- 5.3.3.4.8 nv set/unset system aaa user ssh authorized-key
- 5.3.3.4.9 nv set/unset system aaa user
- 5.3.3.4.10 nv set/unset system aaa user full-name
- 5.3.3.4.11 nv set/unset system aaa user state
- 5.3.3.4.12 nv set/unset system aaa user role

- 5.3.3.4.13 nv set/unset system aaa user password
- 5.3.3.4.14 nv set/unset system aaa user hashed-password
- 5.3.3.4.15 nv set/unset system aaa allow-reset-local-passwords state
- 5.3.3.4.16 nv set/unset system aaa user spiffe-id


### 5.3.3.4.1 nv show system aaa user

| | |
|---|---|
| | nv show system aaa user<br>Displays list of users, their role and status. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | |

```
admin@nvos:~$ nv show system aaa user

Username  Full-name             Role     State
--------  --------------------  -------  -------
admin     System Administrator  admin    enabled
monitor   System Monitor        monitor  enabled
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/user |
| Related Commands | nv set system aaa user |
| Notes | |

### 5.3.3.4.2 nv show system aaa user id

| | | |
|---|---|---|
| | nv show system aaa user <user-id><br>Displays configuration of a user. | |
| Syntax Description | user-id | The user (e.g., monitor, test) |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |

```
admin@nvos:~$ nv show system aaa user admin
                  operational           applied
------------------  --------------------  --------------------
state               enabled               enabled
role                admin                 admin
full-name           System Administrator  System Administrator
password            *                     *
hashed-password     *                     *
ssh
  [authorized-key]
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/user/{user-id} |
| Related Commands | nv show system aaa user<br>nv set system aaa user |
| Notes | |

### 5.3.3.4.3 nv show system aaa user ssh authorized-key

| | | |
|---|---|---|
| | nv show system aaa user <user-id> ssh authorized-key <authorized-key-id><br>Lists all SSH keys associated with the specified user. | |
| Syntax Description | user-id | The user (e.g., monitor, test) |
| | authorized-key-id | Name of the SSH key (item-name) (enum: saved keys of user) |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |

```
admin@nvos:~$ nv show sys aaa user admin ssh authorized-key

SSH Key Name  Key string  Key Type
------------  ----------  --------------------
key1          *           ecdsa-sha2-nistp256
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/user/<user>/ssh/authorized-key |
| Related ommands | |
| Notes | The key string is obfuscated yet not regarded as a secret within NVOS. |

### 5.3.3.4.4 nv show system aaa user ssh authorized-key id

| | | |
|---|---|---|
| | nv show system aaa user <user-id> ssh authorized-key <ssh-authorized-key-id><br>Displays details for a specific SSH key. | |
| Syntax Description | user-id | The user (e.g., monitor, test) |
| | authorized-key-id | Name of the SSH key (item-name) (enum: saved keys of user) |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |

```
admin@nvos:~$ nv show sys aaa user admin ssh authorized-key key1

      operational          applied
----  -------------------  -------------------
key   *                    *
type  ecdsa-sha2-nistp256  ecdsa-sha2-nistp256
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/user/<user-id>/ssh/authorized-key/<ssh-authorized-key-id> |
| Related Commands | |
| Notes | The key string is obfuscated yet not regarded as a secret within NVOS. |

### 5.3.3.4.5 nv show system aaa user ssh

| | | |
|---|---|---|
| | nv show system aaa user <user-id> ssh<br>Display user SSH configuration. | |
| Syntax Description | user-id | The user (e.g., monitor, test) |

| | |
|---|---|
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show sys aaa user admin ssh`<br><br>`  operational  applied`<br>`----------  -----------  -------`<br>`[authorized-key]  key1  key1` |
| REST API | GET https://<ip>/nvue_v1/system/aaa/user/<user-id>/ssh |
| Related Commands | |
| Notes | Key string in obfuscated but is not considered a secret in nvos. |

### 5.3.3.4.6 nv show system aaa allow-reset-local-passwords

| | |
|---|---|
| | nv show system aaa allow-reset-local-passwords<br>Displays state of resetting the local users passwords upon long reboot press |
| Syntax | N/A |
| Default | Enabled |
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show system aaa allow-reset-local-passwords`<br>`  operational  applied`<br>`-----  -----------  -------`<br>`state  enabled  enabled` |
| REST API | GET https://<ip>/nvue_v1/system/aaa/allow-reset-local-passwords |
| Related Commands | nv set system allow-reset-local-passwords state <enabled\|disabled> |
| Notes | |

### 5.3.3.4.7 nv show system aaa user spiffe-id

| | |
|---|---|
| | nv show system aaa user <user-id> spiffe-id<br>Display all SPIFFE IDs of a given user. |
| Syntax | N/A |
| Default | Enabled |
| History | 25.02.4002 |
| Example | <br>`admin@nvos:~$ nv show sys aaa user admin ssh spiffe-id`<br><br>`Spiffe Id`<br>`----------`<br>`spiffe://example.com/prod` |
| REST API | GET https://<ip>/nvue_v1/system/aaa/user/<user>/spiffe-id |
| Related Commands | nv set system aaa user <user-id> spiffe-id <spiffe-id> |
| Notes | Same as with certificate, the value for each spiffe-id is empty. |

### 5.3.3.4.8 nv set/unset system aaa user ssh authorized-key

| | | |
|---|---|---|
| | nv set system aaa user <user-id> ssh authorized-key <ssh-authorized-key-id> {key \| type}<br>nv unset system aaa user <user> ssh authorized-key <ssh-authorized-key-id> {key \| type}<br>Authorized SSH key configuration.<br>The unset form of the command clears configuration of SSH parameters for a user. | |
| Syntax Description | user-id | Name of the user (user-name) (enum: local users) |
| | authorized-key-id | Name of the SSH key (item-name) (enum: saved keys of user) |
| | key | The base64 contents of the key (key-string) |
| | type | The type of encoded key (string \| enum:ecdsa-sha2-nistp256, ecdsa-sha2-nistp384, ecdsa-sha2-nistp521, ssh-ed25519, ssh-rsa \| default:ssh-rsa) |
| Default | key=N/A<br>type=ssh-rsa | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set sys aaa user admin ssh authorized-key key1 key AAAdnfs…==<br>admin@nvos:~$ nv set sys aaa user admin ssh authorized-key key1 type nistp384<br><br>admin@nvos:~$ nv unset sys aaa user admin ssh authorized-key<br>admin@nvos:~$ nv unset sys aaa user admin ssh authorized-key key1<br>admin@nvos:~$ nv unset sys aaa user admin ssh authorized-key key1 type<br>admin@nvos:~$ nv unset sys aaa user admin ssh authorized-key key1 key | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/user/<user-id>/ssh/authorized-key/<ssh-authorized-key-id> | |
| Related Commands | | |
| Notes | | |

### 5.3.3.4.9 nv set/unset system aaa user

| | | |
|---|---|---|
| | nv set system aaa user <user-id><br>nv unset system aaa user <user-id><br>Specifies a username and creates a user account. New users are created initially with admin privileges.<br>The unset form of the command deletes the user account. | |
| Syntax Description | user-id | The user.<br>Username max length is 32 and it begins with a letter or an underscore, followed by letters, digits, underscores, or dashes. They can end with a dollar sign. |
| Default | The following usernames are available by default:<br>* admin<br>* monitor | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv set system aaa user test` |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/user/{user-id} |
| Related Commands | nv show system aaa user<br>nv set system aaa user password |
| Notes | • New users must have a password.<br>• Default users cannot be deleted. |

### 5.3.3.4.10 nv set/unset system aaa user full-name

| | | |
|---|---|---|
| | nv set system aaa user <user-id> full-name <full-name><br>nv unset system aaa user <user-id> full-name <full-name><br>Configures user's full-name (Gecos Field).<br>The unset form of the command sets user full-name (Gecos Field) to empty. | |
| Syntax Description | user-id | The user |
| | full-name | The full name of the user |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa user test full-name "Test User"` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/user/{user-id} | |
| Related Commands | nv show system aaa user<br>nv set system aaa user | |
| Notes | | |

### 5.3.3.4.11 nv set/unset system aaa user state

| | | |
|---|---|---|
| | nv set system aaa user <user-id> state <enable \| disable><br>nv unset system aaa user <user-id> state<br>Enables/disables the user account.<br>The unset form of the command returns the user account state to its default state (enabled). | |
| Syntax Description | user-id | The user |
| Default | Enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa user test state disabled` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/user/{user-id} | |
| Related Commands | nv show system aaa user<br>nv set system aaa user | |
| Notes | Disabling a user account will terminate all user bash terminals. | |

### 5.3.3.4.12 nv set/unset system aaa user role

| | | |
|---|---|---|
| | nv set system aaa user <user-id> role <role-id><br>nv unset system aaa user <user-id> role<br>Configures user role (capabilities).<br>The unset form of the command return the user account role to its default (admin). | |
| Syntax Description | user-id | The user |
| | role-id | The name of the role |
| Default | admin | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa user test role monitor` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/user/{user-id} | |
| Related Commands | nv show system aaa user<br>nv show system aaa role<br>nv set system aaa user | |
| Notes | | |

### 5.3.3.4.13 nv set/unset system aaa user password

| | | |
|---|---|---|
| | nv set system aaa user <user-id> password <password><br>nv unset system aaa user <user-id> password<br>Configures a login password in cleartext.<br>The unset form of the command clears the user password for non-default users. For default users, the default password will be expired and must be reconfigured in the next login. | |
| Syntax Description | user-id | The user |
| | password | A password for the user in string form.<br>A string containing special Linux characters must be quoted or have the special characters escaped (i.e., add "\" before each special character).<br>Examples:<br>`pass\!word`<br>`"pass!word"`<br><br>A leading dot is a special case and it must be escaped even if it is quoted:<br>Examples:<br>`"\.password"`<br>`\\.password` |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa user test password "pa\!sswOrd"`<br><br>`admin@nvos:~$ nv set system aaa user test password`<br>`Enter new password:`<br>`Confirm password:` | |

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/user/{user-id} |
| Related Commands | nv show system aaa user<br>nv set system aaa user |
| Notes | • If no password was specified, user will be prompted to configure the password.<br>• If password hardening is enabled, the new password must match all configured policies.<br>• A string containing special Liznux characters must be quoted or have the special characters escaped (i.e., add "\" before each special character).<br>Examples:<br>`pass\!word`<br>`"pass!word"`<br><br>A leading dot is a special case and it must be escaped even if it is quoted:<br>Examples:<br>`"\.password"`<br>`\\.password`<br>• A password is required, therefore a password must be configured before applying new configurations. |

### 5.3.3.4.14 nv set/unset system aaa user hashed-password

| | | |
|---|---|---|
| | nv set system aaa user <user-id> hashed-password <hashed-password><br>nv unset system aaa user <user-id> hashed-password<br>Configures a login password in encrypted format.<br>The unset form of the command clears the user hashed-password. | |
| Syntax Description | user-id | The user |
| | hashed-password | A password for the user in encrypted text.<br>Special Linux characters must be escaped (add "\" before each special character). |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa user test password "\$y\$j9T\$YwHwJEhi5c2oCgNNVJZgR0\$TboB1DcoS2iGmneLa/9Y54hsAgq9milQKGYmmkRffJC"` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/user/{user-id} | |
| Related Commands | nv show system aaa user<br>nv set system aaa user<br>nv set system aaa user password | |
| Notes | • If password hardening is enabled, hashed-password configuration will be blocked.<br>• Special Linux characters must be escaped (i.e., add "\" before each special character).<br>• A password is required, therefore a password must be configured before applying new configurations. | |

### 5.3.3.4.15 nv set/unset system aaa allow-reset-local-passwords state

| | | |
|---|---|---|
| | nv set system aaa allow-reset-local-passwords state <enabled \| disabled><br>nv unset system aaa allow-reset-local-passwords state<br>Enables/disables the ability to reset local users' passwords upon long reboot press.<br>The unset form of the command returns the state of feature to its default state (enabled). | |
| Syntax | state | enabled, disabled |
| Default | Enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa allow-reset-local-passwords state disabled` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/allow-reset-local-passwords | |
| Related Commands | nv show system aaa allow-reset-local-passwords | |
| Notes | | |

### 5.3.3.4.16 nv set/unset system aaa user spiffe-id

| | | |
|---|---|---|
| | nv set system aaa user <user-id> spiffe-id <spiffe-id><br>nv unset system aaa user <user-id> spiffe-id<br>Configure all SPIFFE IDs of a given user.<br>The unset form of the command clears all SPIFFE IDs for a user. | |
| Syntax Description | spiffe-id | SPIFFE ID mapped to the user (string)<br>SPIFFE ID must be in format `spiffe://trust-domain/path`, where the trust-domain and path has only letters, numbers, dots, dashes, and underscores |
| Default | N/A | |
| History | 25.02.4002 | |
| Example | `admin@nvos:~$ nv set system aaa user admin spiffe-id spiffe://trust/domain` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/user/<user>/ spiffe-id /<ssh- spiffe-id> | |
| Related Commands | nv show system aaa user spiffe-id | |
| Notes | | |

## 5.3.4 LDAP Authentication and Authorization


- 5.3.4.1 Supported Features
- 5.3.4.2 LDAP Configuration
- 5.3.4.3 LDAP Groups and User Privileges
  - 5.3.4.3.1 LDAP Server Group Configuration Example
- 5.3.4.4 LDAP Secure Connection
- 5.3.4.5 LDAP Client Simple Configuration Example

- 5.3.4.6 Configure LDAP Server Settings
  - 5.3.4.6.1 Connection
  - 5.3.4.6.2 Set the Authentication Order
  - 5.3.4.6.3 Search Function
  - 5.3.4.6.4 LDAP Version
  - 5.3.4.6.5 LDAP Timeouts
  - 5.3.4.6.6 SSL Options
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- 5.3.4.7 LDAP Verification Tools
  - 5.3.4.7.1 Identify a User with the id Command
  - 5.3.4.7.2 getent
- 5.3.4.8 LDAP Commands


NVOS implements LDAP client AAA (Accounting, Authentication, and Authorization) in a transparent way with minimal configuration. There is no need to create accounts or directories on the switch.

NVOS uses Pluggable Authentication Modules (PAM) and Name Service Switch (NSS) for user authentication. NSS enables PAM to use LDAP to provide user authentication, group mapping, and information for other services on the system.

### 5.3.4.1 Supported Features

- Authentication using PAM: Supports login, SSH, `sudo`, and `su`.
- Runs over the eth0 management interface.
- Supports up to eight LDAP servers.

### 5.3.4.2 LDAP Configuration

LDAP configuration consists of two levels:

1. Global Configuration: Settings that apply to all LDAP servers unless overridden.
2. Per-Server Configuration: Specific settings for individual LDAP servers.

If a per-server configuration is not defined, the system will automatically use the settings from the global configuration.

All nv ldap commands are in LDAP Commands section. Global commands are under `/system/aaa/ldap`, and per-server commands are under `/system/aaa/ldap/server/<hostname-id>`.

### 5.3.4.3 LDAP Groups and User Privileges

The LDAP server configuration assigns them to specific groups. The GID is now unique by default and can be assigned to any GID by design.

1. Admin privileged users: 4(adm), 27(sudo), 999(docker), 1001(redis), 995(nvaction), 997(nvapply)
2. Monitor privileged users: 4(adm), 998(nvshow)
3. Non-privileged users: No NV commands access

#### 5.3.4.3.1 LDAP Server Group Configuration Example

Below is an example of configuring LDAP server groups. This configuration allows you to define a group of LDAP servers with common settings while enabling server-specific overrides when necessary.

```
dn: cn=nvset,ou=People,dc=itzgeek,dc=local
objectClass: posixGroup
cn: nvaction
gidNumber: 995
memberUid: adminuser
```

### 5.3.4.4 LDAP Secure Connection

The SSL section enables configuring the encryption mode for the LDAP client to ensure secure communication.

- Supported Encryption Modes: `start-tls`, `ssl`.
- Default CA Certificate Bundle: The LDAP client uses the default CA certificate bundle located at `/etc/ssl/certs/ca-certificates.crt`.
- Certificate Validation: Certificate validation may be skipped using SSL settings `cert-verify`. When certificate validation is skipped, the certificate is used only to establish a secure connection, without verifying its authenticity.

Ensure proper configuration to maintain secure and reliable LDAP connections.

### 5.3.4.5 LDAP Client Simple Configuration Example

Below is a simple example of configuring an LDAP client. This setup includes basic global settings and per-server configuration.

```
admin@nvos:~$ nv set system aaa ldap bind-dn <ldap-server-bind-dn>
admin@nvos:~$ nv set system aaa ldap secret "ldap-secret"
admin@nvos:~$ nv set system aaa ldap server <ldap-server-ip>
admin@nvos:~$ nv set system aaa ldap base-dn <ldap-server-base-dn>
# set global aaa configs
admin@nvos:~$ nv set system aaa authentication order ldap,local
admin@nvos:~$ nv config apply -y
```

NVOS uses Pluggable Authentication Modules (PAM) and Name Service Switch (NSS) for user authentication. NSS enables PAM to use LDAP to provide user authentication, group mapping, and information for other services on the system.

- NSS specifies the order of the information sources that resolve names for each service. Using NSS with authentication and authorization provides the order and location for user lookup and group mapping on the system.
- PAM handles the interaction between the user and the system, providing login handling, session setup, authentication of users, and authorization of user actions.

> ⚠ LDAP authentication is sensitive to network delay. For optimal performance, NVIDIA recommends a round trip time of 10ms or less between LDAP clients and the LDAP server. If latency is between 10-50ms, NVIDIA recommends changing the authentication order to

prioritize local authentication before LDAP. For connections exceeding 50ms of latency, authentication might experience unacceptable delays; consider alternative authentication methods.

### 5.3.4.6 Configure LDAP Server Settings

LDAP server settings can be configured with NVUE.

#### 5.3.4.6.1 Connection

Configure the following connection settings:

- The hostname or IP address of the LDAP server from which you want to import users. If you use multiple LDAP servers, you can also set a priority for each server.
- The port number of the LDAP server if you are using a non-default port. The default port number for LDAP is TCP and UDP port 389.
- Authenticated (Simple) BIND credentials. The BIND credentials are optional; if you do not specify the credentials, the switch assumes an anonymous bind. To use SASL (Simple Authentication and Security Layer) BIND, which provides authentication services using other mechanisms such as Kerberos, contact your LDAP server administrator for authentication information.

The following example configures the LDAP server and port, and the BIND credentials.

```
admin@nvos:~$ nv set system aaa ldap server ldapserver1
admin@nvos:~$ nv set system aaa ldap port 388
admin@nvos:~$ nv set system aaa ldap bind-dn CN=nvset-admin,CN=Users,DC=rtp,DC=example,DC=test
admin@nvos:~$ nv set system aaa ldap secret 1Q2w3e4r!
admin@nvos:~$ nv config apply
```

The following example sets the priority to 2 for ldapserver2 when using multiple LDAP servers:

```
admin@nvos:~$ nv set system aaa ldap server ldapserver2 priority 2
```

#### 5.3.4.6.2 Set the Authentication Order

To prioritize the order in which NVOS attempts different authentication methods to verify user access to the switch, you set the authentication order. By default, NVOS verifies users according to their local passwords.

When AAA authentication failthrough is enabled, if you set the authentication order to start with LDAP, but the LDAP servers do not have the user in the directory or does not respond, NVOS tries local password authentication.

If no LDAP server is available, local authentication is applied.

To set the authentication order to start with LDAP before local authentication:

```
admin@nvos:~$ nv set system aaa authentication order ldap,local
admin@nvos:~$ nv config apply
```

#### 5.3.4.6.3 Search Function

When an LDAP client requests information about a resource, the client must connect and bind to the server, then perform one or more resource queries depending on the lookup. All search queries to the LDAP server use the configured search *base*, *filter*, and the desired entry (*uid=myuser*). If the LDAP directory is large, this search takes a long time. Define a more specific search base for the common *maps* (*passwd* and *group*).

```
admin@nvos:~$ nv set system aaa ldap base-dn ou=support,dc=rtp,dc=example,dc=test
admin@nvos:~$ nv config apply
```

#### 5.3.4.6.4 LDAP Version

NVOS uses LDAP version 3 by default. If you need to change the LDAP version to 2:

```
admin@nvos:~$ nv set system aaa ldap version 2
admin@nvos:~$ nv config apply
```

#### 5.3.4.6.5 LDAP Timeouts

NVOS provides two timeout settings:

- The bind timeout sets the number of seconds before the BIND operation times out. The default setting is 5 seconds.
- The search timeout sets the number of seconds before the search times out. The default setting is 5 seconds.

The following example sets both the BIND session timeout and the search timeout to 60 seconds.

```
admin@nvos:~$ nv set system aaa ldap timeout-bind 60
admin@nvos:~$ nv set system aaa ldap timeout-search 60
admin@nvos:~$ nv config apply
```

#### 5.3.4.6.6 SSL Options

You can configure the following SSL options:

- SSL mode. You can specify, `none`, `ssl`, or `start-tls`.
- SL port.
- SSL certificate validation.
- SSL cipher suites. You can specify TLS1.2, TLS1.3, TLS-CIPHERS, or all.
- SSL CRL check.

To use IPv6 with SSL or Start TLS, you must set the hostname of the LDAP server instead of the IPv6 address with the nv set system aaa ldap server <hostname> command. See Configure LDAP Server Settings.

The following example sets the SSL mode to SSL, the port to 8443, enables the SSL certificate checker, sets the SSL cipher suites to TLS1.3 and the Certificate Authorities List to /etc/ssl/certs/ca-certificates.crt

```
admin@nvos:~$ nv set system aaa ldap ssl mode ssl
```

```
admin@nvos:~$ nv set system aaa ldap ssl port 8443
admin@nvos:~$ nv set system aaa ldap ssl cert-verify enabled
admin@nvos:~$ nv set system aaa ldap ssl tls-ciphers TLS1.3
admin@nvos:~$ nv config apply
```

### 5.3.4.6.7 Show LDAP Settings

To show the LDAP configuration settings on the switch, run the following commands:

- nv show system aaa ldap shows all the LDAP configuration settings.
- nv show system aaa ldap server shows the configured LDAP servers and their priorities.
- nv show system aaa ldap server <server-id> shows the priority for the specified LDAP server.
- nv show system aaa ldap ssl shows the LDAP SSL configuration settings.

The following example shows all the LDAP configuration settings:

```
admin@nvos:~$ nv show system aaa ldap
                operational                                          applied
--------------  ---------------------------------------------------
-------------------------------------------------
bind-dn         CN=nvset-admin,CN=Users,DC=rtp,DC=example,DC=test  CN=nvset-
admin,CN=Users,DC=rtp,DC=example,DC=test
base-dn         ou=users,dc=example,dc=com                           ou=users,dc=example,dc=com
port            389                                                  388
timeout-bind    5                                                    5
timeout-search  5                                                    5
secret          $nvsec$4fb719e24167246947d4f746f58696fc              $nvsec$4fb719e24167246947d4f746f58696fc
version         3                                                    3
[server]        ldapserver1                                          ldapserver1
ssl
  mode          ssl                                                  ssl
  port          8443                                                 8443
  cert-verify   enabled                                              enabled
  tls-ciphers   TLS1.3                                               TLS1.3
...
```

The following example shows the configured LDAP servers and their priorities:

```
admin@nvos:~$ nv show system aaa ldap server
Hostname     Priority
-----------  --------
ldapserver1  1
ldapserver2  2
```

The following example shows the SSL configuration settings:

```
admin@nvos:~$ nv show system aaa ldap ssl
             operational                        applied
-----------  ---------------------------------  ---------------------------------
mode         ssl                                ssl
port         8443                               8443
cert-verify  enabled                            enabled
tls-ciphers  TLS1.3                             TLS1.3
```

### 5.3.4.7 LDAP Verification Tools

The LDAP client daemon retrieves and caches password and group information from LDAP. To verify the LDAP interaction, use these command-line tools to trigger an LDAP query from the device.

#### 5.3.4.7.1 Identify a User with the id Command

The `id` command performs a username lookup by following the lookup information sources in NSS for the *passwd* service. This returns the user ID, group ID and the group list retrieved from the information source. In the following example, the user *admin* is locally defined in `/etc/passwd`,

and *myuser* is on LDAP. The NSS configuration has the `passwd` map configured with the sources `compat ldap`:

```
admin@radmin:~$ id admin
uid=1000(admin) gid=1000(admin) groups=1000(admin),4(adm),27(sudo),999(docker),1001(redis),996(nvaction),993(nvappl
y)
admin@nvos:~$ id myuser
uid=1230(myuser) gid=3000(Development) groups=3000(Development),500(Employees),27(sudo)
```

#### 5.3.4.7.2 getent

The `getent` command retrieves all records found with NSS for a given map. It can also retrieve a specific entry under that map. You can perform tests with the `passwd`, `group`, `shadow`, or any other map in the `/etc/nslcd.conf` file. The output from this command formats according to the map requested. For the `passwd` service, the structure of the output is the same as the entries in `/etc/passwd`. The group map outputs the same structure as `/etc/group`.

In this example, looking up a specific user in the passwd map, the user *admin* is locally defined in `/etc/passwd`, and *myuser* is only in LDAP.

```
admin@radmin:~$ getent passwd admin
admin:x:1000:1000:System Administrator:/home/admin:/bin/bash
admin@nvos:~$ getent passwd myuser
myuser:x:1230:3000:My Test User:/home/myuser:/bin/bash
```

In the next example, looking up a specific group in the group service, the group *admin* is locally defined in `/etc/groups`, and *netadmin* is on LDAP.

```
admin@nvos:~$ getent group admin
admin:x:1000:
admin@nvos:~$ getent group netadmin
netadmin:*:502:larry,moe,curly,shemp
```

Running the command getent passwd or getent group without a specific request returns all local and LDAP entries for the *passwd* and *group* maps.

### 5.3.4.8 LDAP Commands

- LDAP Commands

### 5.3.4.9 LDAP Commands


- 5.3.4.9.1 nv show system aaa ldap
- 5.3.4.9.2 nv show system aaa ldap server
- 5.3.4.9.3 nv set system aaa ldap server id
- 5.3.4.9.4 nv set system aaa ldap base-dn
- 5.3.4.9.5 nv set system aaa ldap bind-dn
- 5.3.4.9.6 nv set system aaa ldap port
- 5.3.4.9.7 nv set system aaa ldap timeout-bind
- 5.3.4.9.8 nv set system aaa ldap timeout-search
- 5.3.4.9.9 nv set system aaa ldap secret

- 5.3.4.9.10 nv set system aaa ldap map group cn
- 5.3.4.9.11 nv set system aaa ldap map group gidnumber
- 5.3.4.9.12 nv set system aaa ldap map group memberuid
- 5.3.4.9.13 nv set/unset system aaa ldap map passwd gidnumber
- 5.3.4.9.14 nv set system aaa ldap map passwd uid
- 5.3.4.9.15 nv set system aaa ldap map passwd uidnumber
- 5.3.4.9.16 nv set system aaa ldap map passwd userpassword
- 5.3.4.9.17 nv set system aaa ldap version
- 5.3.4.9.18 nv set system aaa ldap ssl mode
- 5.3.4.9.19 nv set system aaa ldap ssl cert-verify
- 5.3.4.9.20 nv set system aaa ldap ssl port


### 5.3.4.9.1 nv show system aaa ldap

| | |
|---|---|
| | nv show system aaa ldap<br>Show LDAP configurations. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |
| Example | |

```
admin@nvos:~$ nv show system aaa ldap

                 operational                    applied
----------------  ------------------------------  ------------------------------
bind-dn          cn=ldapadm,dc=itzgeek,dc=local  cn=ldapadm,dc=itzgeek,dc=local
base-dn          dc=itzgeek,dc=local             dc=itzgeek,dc=local
port             389                             389
timeout-bind     5                               5
timeout-search   5                               5
secret           *                               *
version          3                               3
[server]         10.237.0.86                     10.237.0.86
ssl
  mode           none                            none
  port           636                             636
  cert-verify    disabled                        disabled
  tls-ciphers    all                             all
filter
  passwd         (objectClass=posixAccount)      (objectClass=posixAccount)
  group          (objectClass=posixGroup)        (objectClass=posixGroup)
  shadow         (objectClass=shadowAccount)     (objectClass=shadowAccount)
map
  passwd
    uid          cn                              cn
    uidnumber
    gidnumber
    userpassword
  group
    cn
    memberuid    member                          member
    gidnumber
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/ldap |
| Related Commands | nv set system aaa ldap |
| Notes | LDAP feature in NVOS, the switch is basicly an LDAP client that can be bind to an LDAP server, to support authentication to the switch via LDAP server instead local. |

### 5.3.4.9.2 nv show system aaa ldap server

| | |
|---|---|
| | nv show system aaa ldap server<br>Show remote LDAP servers. |

| | | |
|---|---|---|
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | admin@nvos:~$ nv show system aaa ldap server<br>Hostname Priority<br>---------- --------<br>10.237.0.86 1 | |
| REST API | GET https://<ip>/nvue_v1/system/aaa/ldap/server | |
| Related Commands | nv set system aaa ldap server | |
| Notes | Show LDAP configured servers. | |

### 5.3.4.9.3 nv set system aaa ldap server id

| | | |
|---|---|---|
| | nv set system aaa ldap server<server-id><br>Configure remote LDAP servers. | |
| Syntax Description | server-id | LDAP server ID: ipv4, ipv4-unicas, idn-hostname, ipv6 |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | admin@nvos:~$ nv set system aaa ldap server 1.2.3.4 | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/ldap/server/<server-id> | |
| Related Commands | nv show system aaa ldap server <server-id><br>nv show system aaa ldap server<br>nv show system aaa ldap | |
| Notes | | |

### 5.3.4.9.4 nv set system aaa ldap base-dn

| | | |
|---|---|---|
| | nv set system aaa ldap base-dn <base-dn><br>This command set the base-dn of the LDAP server. | |
| Syntax Description | base-dn | Configure base DN (Distinguished Name) |
| Default | ou=users<br>dc=example<br>dc=com | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system aaa ldap base-dn "dc=itzgeek,dc=local" | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/base-dn | |
| Related Commands | nv show system aaa ldap | |

| | |
|---|---|
| Notes | A base dn is the point from where a server will search for users. |

### 5.3.4.9.5 nv set system aaa ldap bind-dn

| | | |
|---|---|---|
| | nv set system aaa ldap bind-dn <bind dn><br>This command sets the bind-dn of the ldap server. | |
| Syntax Description | bind dn | Configure bind DN (Distinguished Name) |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap bind-dn "cn=ldapadm,dc=itzgeek,dc=local"` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/bind-dn | |
| Related Commands | nv show system aaa ldap | |
| Notes | The Bind DN is the username that will be used to do the searching and request the authentication. | |

### 5.3.4.9.6 nv set system aaa ldap port

| | | |
|---|---|---|
| | nv set system aaa ldap port <1-65535><br>Set LDAP authentication port. | |
| Syntax Description | port | Integer: 1-65535 |
| Default | 389 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap port 389` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/ldap/port | |
| Related Commands | nv show system aaa ldap | |
| Notes | | |

### 5.3.4.9.7 nv set system aaa ldap timeout-bind

| | | |
|---|---|---|
| | nv set system aaa ldap timeout-bind <seconds><br>Set global LDAP max wait until bind timeout (seconds). | |
| Syntax Description | Seconds | Number of seconds |
| Default | 5 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap timeout-bind 5` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/timeout-bind | |

| | |
|---|---|
| Related Commands | nv show system aaa ldap |
| Notes | |

### 5.3.4.9.8 nv set system aaa ldap timeout-search

| | | |
|---|---|---|
| | nv set system aaa ldap timeout-search <seconds><br>Set global LDAP max wait until search timeout (seconds). | |
| Syntax Description | Seconds | Number of seconds |
| Default | cn | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap timeout-search 5` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/timeout-search | |
| Related Commands | nv show system aaa ldap | |
| Notes | | |

### 5.3.4.9.9 nv set system aaa ldap secret

| | | |
|---|---|---|
| | nv set system aaa ldap secret <secret-value><br>Set global LDAP server secret in cleartext. | |
| Syntax Description | secret value | Secret string |
| Default | 3 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap password  123asd` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/secret | |
| Related Commands | nv show system aaa ldap | |
| Notes | | |

### 5.3.4.9.10 nv set system aaa ldap map group cn

| | | |
|---|---|---|
| | nv set system aaa ldap map group cn <cn-str><br>Set LDAP search map for cn attribute for group database. | |
| Syntax Description | cn-str | Common name (string) |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap map group cn itzgeek` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/map/group/cn | |

| | |
|---|---|
| Related Commands | nv show system aaa ldap group |
| Notes | |

### 5.3.4.9.11 nv set system aaa ldap map group gidnumber

| | | |
|---|---|---|
| | nv set system aaa ldap map group gidnumber <gidnumber><br>Set LDAP search map for gidNumber attribute for group database. | |
| Syntax Description | gidnumber | gidNumber string |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap map group  gidNumber 1000` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/map/group/gidnumber | |
| Related Commands | nv show system aaa ldap group | |
| Notes | | |

### 5.3.4.9.12 nv set system aaa ldap map group memberuid

| | | |
|---|---|---|
| | nv set system aaa ldap map group memberuid <memberuid><br>Set LDAP search map for memberUid attribute for group database. | |
| Syntax Description | memberuid | membeUid string |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap map group memberuid admingroup` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/map/group/memberuid | |
| Related Commands | nv show system aaa ldap group | |
| Notes | | |

### 5.3.4.9.13 nv set/unset system aaa ldap map passwd gidnumber

| | | |
|---|---|---|
| | nv set system aaa ldap map passwd gidnumber <gidnumber><br>Set LDAP map for gidNumber attribute for passwd database. | |
| Syntax Description | gidnumber | gidNumber string |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap map group gidnumber 1000` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/map/group/gidNumber | |

| | |
|---|---|
| Related Commands | nv show system aaa ldap passwd |
| Notes | |

### 5.3.4.9.14 nv set system aaa ldap map passwd uid

| | | |
|---|---|---|
| | nv set system aaa ldap map group uid <uid><br>Set LDAP map for UID attribute for passwd database. | |
| Syntax Description | uid | uid string |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap map group uid 1000` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/map/group/uid | |
| Related Commands | nv show system aaa ldap passwd | |
| Notes | | |

### 5.3.4.9.15 nv set system aaa ldap map passwd uidnumber

| | | |
|---|---|---|
| | nv set system aaa ldap map group uidnumber <uidnumber><br>Set LDAP map for uidNumber attribute for passwd database. | |
| Syntax Description | uidnumber | uidNumber string |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap map group uidnumber 1000` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/map/group/uidNumber | |
| Related Commands | nv show system aaa ldap passwd | |
| Notes | | |

### 5.3.4.9.16 nv set system aaa ldap map passwd userpassword

| | | |
|---|---|---|
| | nv set system aaa ldap map passwd userpassword <userpassword><br>Set LDAP map for userPassword attribute for passwd database. | |
| Syntax Description | userpassword | userpassword string |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap map group userpassword password` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/map/group/userpassword | |

| | |
|---|---|
| Related Commands | nv show system aaa ldap passwd |
| Notes | |

### 5.3.4.9.17 nv set system aaa ldap version

| | | |
|---|---|---|
| | nv set system aaa ldap version <ldap-version><br>Set LDAP protocol version to be used. | |
| Syntax Description | ldap-version | 2 or 3 |
| Default | 3 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa ldap version 2` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap | |
| Related Commands | nv show system aaa ldap | |
| Notes | | |

### 5.3.4.9.18 nv set system aaa ldap ssl mode

| | | |
|---|---|---|
| | nv set system aaa ldap ssl mode <ssl-mode><br>Set the password of the LDAP server. | |
| Syntax Description | ssl-mode | none, ssl, start-tls |
| Default | None | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set sys aaa ldap ssl mode start-tls` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/ssl/mode | |
| Related Commands | nv show system aaa ldap | |
| Notes | | |

### 5.3.4.9.19 nv set system aaa ldap ssl cert-verify

| | | |
|---|---|---|
| | nv set system aaa ldap ssl cert-verify <enable \| disable><br>Set CA certificate validation state. | |
| Syntax Description | enable | Validates certificate |
| | disable | Skips certificate validation |
| Default | Enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set sys aaa ldap ssl mode cert-verify` | |

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/ssl/cert-verify |
| Related Commands | nv show system aaa ldap |
| Notes | |

### 5.3.4.9.20 nv set system aaa ldap ssl port

| | | |
|---|---|---|
| | nv set system aaa ldap ssl port <1-65535><br>Set LDAP's authentication port. | |
| Syntax Description | port | Integer: 1-65535 |
| Default | 636 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set sys aaa ldap ssl port 636` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/ldap/ssl/port | |
| Related Commands | nv show system aaa ldap | |
| Notes | | |

## 5.3.5 TACACS


- 5.3.5.1 Supported Features
- 5.3.5.2 TACACS Users
  - 5.3.5.2.1 TACACS Server Setup and Usage Example
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- 5.3.5.8 TACACS Commands


NVOS implements TACACS+ client AAA in a transparent way with minimal configuration. The client implements the TACACS+ protocol as described in this IETF document. There is no need to create accounts or directories on the switch. Accounting records go to all configured TACACS+ servers by default.

TACACS+ in NVOS:

- Uses PAM authentication and includes `login`, `ssh`, `sudo` and `su`.
- Allows users with privilege level 15 to run any command with sudo.

- Allows users with privilege level 15 to run NVUE `nv set`, `nv unset`, and `nv apply` commands in addition to `nv show` commands. TACACS+ users with a privilege level 7 can only execute `nv show` commands. Other privilege users have no permissions.
- Supports up to eight TACACS+ servers. Be sure to configure your TACACS+ servers in addition to the TACACS+ client. Refer to your TACACS+ server documentation.

### 5.3.5.1 Supported Features

- Authentication using PAM: includes `login`, `ssh`, `sudo` and `su`
- Runs over the eth0 management interface
- Up to eight TACACS+ servers

TACACS configuration is made of global configurations and per-server configurations. In general, if per-server configuration is not defined, the configuration will be taken from the global configuration.

All nv tacacs commands can be found in TACACS Commands, where global ones are direct under `/system/aaa/tacacs` and per-server ones or under `/system/aaa/tacacs/hostname/<hostname-id>`.

### 5.3.5.2 TACACS Users

NVOS supports three types of RADIUS users defined by priv-lvl configured in TACACS server.

- priv-lvl=15 # admin privileged users (nv set, nv config apply)
- priv-lvl=7 # monitor privileged users (nv show)
- priv-lvl=1 # non-privileged users (no nv commands access

#### 5.3.5.2.1 TACACS Server Setup and Usage Example

TACACS server can be configured either on a remote host or on the switch itself (for testing or sanity-check).

Basic configuration for users and clients can be done in `/etc/tacplus_nss.conf` file.

Users Configuration

```
user = username {
        login = cleartext "login_password"
        pap = cleartext "pap_password"
        service = exec {
        priv-lvl=<15,7,1>
        }
}
```

Client Configuration

Client configuration allows specific client IPs and CIDR blocks.

```
key = "client-secret"
and:
acl = default   {
                #permit = 192\.168\.0\.
                permit = 10\.7\.140\.30
                permit = .*
}
```

After configuring a tacacs server, configure the client:

```
admin@nvos:~$ nv set system aaa tacacs hostname <tacacs-server-ip> secret tacacs-secret
admin@nvos:~$ nv set system aaa authentication order tacacs,local
admin@nvos:~$ nv config apply -y
```

### 5.3.5.3 TACACS+ Accounting

#### 5.3.5.3.1 TACACS Accounting Configuration

TACACS accounting logs user activity and commands executed on the system, providing an audit trail for security and compliance. It ensures accountability by sending these logs to configured TACACS+ servers. The logs will be sent to the first server to respond.

TACACS accounting is managed under the `/etc/tacplus_nss.conf` file.
After configuring a TACACS server and client, enable accounting with the command `nv set system aaa tacacs accounting state enabled`.

### 5.3.5.4 Required TACACS+ Client Configuration

Configure the following required settings on the switch (the TACACS+ client).

- Set the IP address or hostname of at least one TACACS+ server.
- Set the secret (key) shared between the TACACS+ server and client.

If you use NVUE commands to configure TACACS+, you must also set the priority for the authentication order for local and TACACS+ users.

NVUE commands require you to specify the priority for each TACACS+ server. You must set a priority even if you only specify one server.

The following example commands set:

- The TACACS+ server priority to 5.
- The IP address of the server to 192.168.0.30.
- The secret to abcdefghijklmnopqrstuvwxyz.

If you include special characters in the password (such as $), you must enclose the password in single quotes (').

- The authentication order so that TACACS+ authentication has priority over local (the lower number has priority).

```
admin@nvos:~$ nv set system aaa tacacs server 192.168.0.30 priority 5
admin@nvos:~$ nv set system aaa tacacs server 192.168.0.30 secret abcdefghijklmnopqrstuvwxyz
admin@nvos:~$ nv set system aaa authentication order tacacs,local
admin@nvos:~$ nv config apply
```

If you want the server to use IPv6, you must add the `nv set system aaa tacacs server <server-id> prefer-ip-version 6` command:

```
admin@nvos:~$ nv set system aaa tacacs server SERVER1 priority 5
admin@nvos:~$ nv set system aaa tacacs server SERVER1 prefer-ip-version 6
...
```

If you configure more than one TACACS+ server, you need to set the priority for each server. If the switch cannot establish a connection with the server that has the highest priority, it tries to establish a connection with the next highest priority server. The server with the lower number has the higher priority. In the example below, server 192.168.0.30 with a priority value of 5 has a higher priority than server 192.168.1.30, which has a priority value of 8. NVOS allows to configure up to 8 servers with unique priority 1 to 8.

```
admin@nvos:~$ nv set system aaa tacacs server 192.168.0.30 priority 5
admin@nvos:~$ nv set system aaa tacacs server 192.168.0.30 secret abcdefghijklmnopqrstuvwxyz
admin@nvos:~$ nv set system aaa tacacs server 192.168.1.30 priority 8
admin@nvos:~$ nv set system aaa tacacs server 192.168.0.30 secret zyxwvutsrqponmlkjihgfedcba
admin@nvos:~$ nv config apply
```

### 5.3.5.5 Optional TACACS+ Configuration

You can configure the following optional TACACS+ settings:

- The port to use for communication between the TACACS+ server and client. By default, NVOS uses IP port 49.
- The TACACS timeout value, which is the number of seconds to wait for a response from the TACACS+ server before trying the next TACACS+ server. You can specify a value between 0 and 60. The default is 5 seconds.
- The TACACS+ authentication type. You can specify PAP to send clear text between the user and the server, CHAP to establish a PPP connection between the user and the server, or login. The default is PAP.

The following example commands set the timeout to 10 seconds and the TACACS+ server port to 32:

```
admin@nvos:~$ nv set system aaa tacacs timeout 10
admin@nvos:~$ nv set system aaa tacacs server SERVER1 port 32
admin@nvos:~$ nv config apply
```

The following example command sets the global authentication type to CHAP:

```
admin@nvos:~$ nv set system aaa tacacs authentication mode chap
admin@nvos:~$ nv config apply
```

### 5.3.5.6 TACACS+ Authorization

By default, TACACS+ performs authorization locally to ensure optimal performance.

However, it is possible to configure TACACS+ to perform authorization for every new connection using the nv set system aaa authorization mode command.

### 5.3.5.7 Troubleshooting

#### 5.3.5.7.1 Show TACACS+ Configuration

Run the following commands to show TACACS+ configuration:

- To show all TACACS+ configuration (NVUE hides server secret keys), run the nv show system aaa tacacs command.
- To show TACACS+ authentication configuration, run the nv show system aaa tacacs authentication command.
- To show TACACS+ accounting configuration, run the nv show system aaa tacacs accounting command.
- To show TACACS+ server configuration, run the nv show system aaa tacacs server command.
- To show TACACS+ server priority configuration, run the nv show system aaa tacacs server <priority-id> command.
- To show the list of users excluded from TACACS+ server authentication, run the nv show system aaa tacacs exclude-user command.

The following example command shows all TACACS+ configuration:

```
admin@nvos:~$ nv show system aaa tacacs
                   applied
------------------ -------
timeout            5
accounting
  state            enabled
authentication
  mode             pap
[server]           5
[server]           8
```

#### 5.3.5.7.2 Incorrect Shared Key

The TACACS client on the switch and the TACACS server must have the same shared secret key. If this key is incorrect, the following message prints to `syslog`:

```
2017-09-05T19:57:00.356520+00:00 leaf01 sshd[3176]: nss_tacplus: TACACS+ server 192.168.0.254:49 read failed with
protocol error (incorrect shared secret?) user admin
```

#### 5.3.5.7.3 Debug Issues with Accounting Records

If you add or delete TACACS+ servers from the configuration files, make sure you notify the `audisp` plugin with this command:

```
admin@nvos:~$ sudo killall -HUP audisp-tacplus
```

If accounting records do not send, add *debug=1* to the `/etc/audisp/audisp-tac_plus.conf` file, then run the command above to notify the plugin. Ask the TACACS+ user to run a command and examine the end of `/var/log/syslog` for messages from the plugin. You can also check the

auditing log file `/var/log/audit audit.log` to be sure the auditing records exist. If the auditing records do not exist, restart the audit daemon with:

```
admin@nvos:~$ sudo systemctl restart auditd.service
```

#### 5.3.5.7.4 TACACS+ Client Configuration Files

The following table describes the TACACS+ client configuration files that NVOS uses.

| Filename | Description |
|---|---|
| `/etc/nsswitch.conf` | When the `libnss_tacplus` package installs, this file configures tacplus lookups through `libnss_tacplus`. If you replace this file by automation, you need to add tacplus as the first lookup method for the *passwd* database line. |
| `/etc/tacplus_nss.conf` | Sets the basic parameters for `libnss_tacplus`. The file includes a debug variable for debugging NSS lookups separately from other client packages. |
| `/usr/share/pam-configs/tacplus` | The configuration file for `pam-auth-update` to generate the files in the next row. The file uses these configurations at `login`, by `su`, and by `ssh`. |
| `/etc/pam.d/common-*` | The `/etc/pam.d/common-*` files update for `tacplus` authent ication. The files update with `pam-auth-update` when you install or remove `libpam-tacplus`. |
| `/etc/audit/audit.rules` | The audit rules file that generate when you install `auditd`. |

### 5.3.5.8 TACACS Commands

- TACACS Commands

### 5.3.5.9 TACACS Commands


- 5.3.5.9.1 nv show system aaa tacacs accounting
- 5.3.5.9.2 nv show system aaa tacacs server
- 5.3.5.9.3 nv show system aaa tacacs authentication
- 5.3.5.9.4 nv set system aaa tacacs accounting
- 5.3.5.9.5 nv set system aaa tacacs server
- 5.3.5.9.6 nv set system aaa tacacs port
- 5.3.5.9.7 nv set/unset system aaa tacacs authentication mode
- 5.3.5.9.8 nv set system aaa tacacs secret
- 5.3.5.9.9 nv set system aaa tacacs timeout
- 5.3.5.9.10 nv set system aaa tacacs server auth-port
- 5.3.5.9.11 nv set system aaa tacacs server auth-mode
- 5.3.5.9.12 nv set system aaa tacacs server secret
- 5.3.5.9.13 nv set system aaa tacacs server priority
- 5.3.5.9.14 nv set system aaa tacacs server timeout

### 5.3.5.9.1 nv show system aaa tacacs accounting

| | |
|---|---|
| | nv show system aaa tacacs accounting<br>Show TACACS accounting configuration. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>admin@nvos:~$ nv show system aaa tacacs accounting<br>operational applied<br>----- ----------- --------<br>state disabled disabled |
| REST API | GET https://<ip>/nvue_v1/system/aaa/tacacs/accounting |
| Related Commands | nv set system aaa tacacs accounting state |
| Notes | Enable/disable tacacs accounting feature |

### 5.3.5.9.2 nv show system aaa tacacs server

| | |
|---|---|
| | nv show system aaa tacacs server<br>Show remote TACACS servers. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command syntax |
| Example | <br>admin@nvos:~$ nv show system aaa tacacs server<br>Hostname Auth type Port Priority Secret Timeout<br>---------- --------- ---- -------- ------ -------<br>10.2.30.40 pap 49 1 * 5 |
| REST API | GET https://<ip>/nvue_v1/system/aaa/tacacs/server |
| Related Commands | nv set system aaa tacacs server |
| Notes | Show TACACS configured servers. |

### 5.3.5.9.3 nv show system aaa tacacs authentication

| | |
|---|---|
| | nv show system aaa tacacs authentication<br>Show TACACS authentication global configuration. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.3000 |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv show system aaa tacacs auth`<br>`  operational  applied`<br>`----  -----------  -------`<br>`mode  pap  pap` |
| REST API | GET https://<ip>/nvue_v1/system/aaa/tacacs/authentication |
| Related Commands | |
| Notes | |

### 5.3.5.9.4 nv set system aaa tacacs accounting

| | | |
|---|---|---|
| | nv set system aaa tacacs accounting state <enabled \| disabled><br>Configure remote TACACS servers. | |
| Syntax Description | state | enum: enabled \| disabled |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv set system aaa tacacs accounting state enabled` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/accounting/state/<enabled/disabled> | |
| Related Commands | nv show system aaa tacacs accounting<br>nv show system aaa tacacs | |
| Notes | | |

### 5.3.5.9.5 nv set system aaa tacacs server

| | | |
|---|---|---|
| | nv set system aaa tacacs server <server-id><br>Configure remote TACACS servers. | |
| Syntax Description | server-id | TACACS server ID: ipv4, ipv4-unicas, idn-server, ipv6 |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | <br>`admin@nvos:~$ nv set system aaa tacacs server 1.2.3.4` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/server/<server-id> | |
| Related Commands | nv show system aaa tacacs server <server-id><br>nv show system aaa tacacs server<br>nv show system aaa tacacs | |
| Notes | | |

### 5.3.5.9.6 nv set system aaa tacacs port

| | | |
|---|---|---|
| | nv set system aaa tacacs port <1-65535><br>Configure global TACACS authentication port. | |
| Syntax Description | port | Integer: 1-65535 |
| Default | 49 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa tacacs port 51` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/port | |
| Related Commands | nv show system aaa tacacs | |
| Notes | | |

### 5.3.5.9.7 nv set/unset system aaa tacacs authentication mode

| | | |
|---|---|---|
| | nv set system aaa tacacs authentication mode <pap \| chap \| login><br>nv unset system aaa tacacs authentication mode<br>Configure global authentication type<br>The unset form of the command sets the global authentication type to its default value. | |
| Syntax Description | auth-type | enum: chap, pap, login |
| Default | pap | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set sys aaa tacacs authentication mode chap` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/authentication | |
| Related Commands | nv show system aaa tacacs | |
| Notes | | |

### 5.3.5.9.8 nv set system aaa tacacs secret

| | | |
|---|---|---|
| | nv set system aaa tacacs secret <string \| prompt><br>Configure global TACACS secret in cleartext. | |
| Syntax Description | secret | string \| prompt |
| Default | "" | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa tacacs secret tacacs-secret` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/secret | |

| | |
|---|---|
| Related Commands | nv show system aaa tacacs |
| Notes | |

### 5.3.5.9.9 nv set system aaa tacacs timeout

| | | |
|---|---|---|
| | nv set system aaa tacacs timeout <1-60><br>Configure the global tacacs reply timeout (seconds) | |
| Syntax Description | timeout | Integer: 1-60 |
| Default | 3 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa tacacs timeout 5` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/timeout | |
| Related Commands | nv show system aaa tacacs | |
| Notes | | |

### 5.3.5.9.10 nv set system aaa tacacs server auth-port

| | | |
|---|---|---|
| | nv set system aaa tacacs server <server-id> port <1-65535><br>Configure tacacs authentication port for server | |
| Syntax Description | server-id | TACACS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | auth-port | Integer: 1-65535 |
| Default | None (set by TACACS global configuration) | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system aaa taccs server 1.2.3.4 port 50` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/server/<server-id>/port/<port> | |
| Related Commands | nv show system aaa tacacs server <server-id><br>nv show system aaa tacacs server<br>nv show system aaa tacacs | |
| Notes | | |

### 5.3.5.9.11 nv set system aaa tacacs server auth-mode

| | | |
|---|---|---|
| | nv set system aaa tacacs server <server-id> auth-mode <pap \| chap \| login><br>Configure TACACS authentication type for server. | |
| Syntax Description | server-id | TACACS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | auth-type | Enum: pap, chap, login |
| Default | None (set by tacacs global config) | |

| | |
|---|---|
| History | 25.02.2002<br>25.02.3000 Updated command syntax |
| Example | `admin@nvos:~$ nv set system aaa tacacs server 1.2.3.4 auth-mode chap` |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/server/<server-id>/auth-mode/<auth-mode> |
| Related Commands | nv show system aaa tacacs server <server-id><br>nv show system aaa tacacs server<br>nv show system aaa tacacs |
| Notes | |

### 5.3.5.9.12 nv set system aaa tacacs server secret

| | | |
|---|---|---|
| | nv set system aaa tacacs server <server-id> secret <string \| prompt><br>Configure server secret in cleartext. | |
| Syntax Description | server-id | TACACS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | secret | string \| prompt |
| Default | None (set by tacacs global config) | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system aaa tacacs server 1.2.3.4 secret Tacacs-Server-Password` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/server/<server-id>/password/<SECRET> | |
| Related Commands | nv show system aaa tacacs server <server-id><br>nv show system aaa tacacs server<br>nv show system aaa tacacs | |
| Notes | | |

### 5.3.5.9.13 nv set system aaa tacacs server priority

| | | |
|---|---|---|
| | nv set system aaa tacacs server <server-id> priority <1-8><br>Configure tacacs priority for server. | |
| Syntax Description | server-id | Tacacs server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | priority | Integer: 1-8 |
| Default | 1 | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system aaa tacacs server 1.2.3.4 priority 5` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/server/<server-id>/priority/<priority-value> | |

| | |
|---|---|
| Related Commands | nv show system aaa tacacs server <server-id><br>nv show system aaa tacacs server<br>nv show system aaa tacacs |
| Notes | |

### 5.3.5.9.14 nv set system aaa tacacs server timeout

| | | |
|---|---|---|
| | nv set system aaa tacacs server <server-id> timeout <1-60><br>Configure the reply timeout for a TACACS server (seconds). | |
| Syntax Description | server-id | TACACS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | timeout | Integer: 1-60 |
| Default | None (set by TACACS global configuration) | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | admin@nvos:~$ nv set system aaa tacacs server 1.2.3.4 timeout 5 | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/tacacs/server/<server-id>/timeout/<timeout-value> | |
| Related Commands | nv show system aaa tacacs server <server-id><br>nv show system aaa tacacs server<br>nv show system aaa tacacs | |
| Notes | | |

## 5.3.6 RADIUS

Various add-on packages enable RADIUS users to log in to NVOS switches in a transparent way with minimal configuration. There is no need to create accounts or directories on the switch. Authentication uses PAM and includes login, `ssh`, restapi, `sudo` and `su`.

### 5.3.6.1 RADIUS Client

RADIUS configuration is made of global configurations and per-server configurations. In general, if per-server configuration is not defined, the configuration will be taken from the global configuration.

All nv radius commands can be found in RADIUS Commands, where global ones are direct under /system/aaa/radius and per-server ones or under /system/aaa/radius/server/<hostname-id>

### 5.3.6.2 Radius Users

NVOS supports 3 types of RADIUS users, defined by Management-Privilege-Level configured in radius-server.

- Management-Privilege-Level := 15 # admin privileged users (nv set, nv config apply)
- Management-Privilege-Level := 7 # monitor privileged users (nv show)
- Management-Privilege-Level := 1 # non-privileged users (no nv commands access)

### 5.3.6.3 RADIUS Server Setup and Usage Example

Radius server can be configured either on a remote host, or on the switch itself (for testing or sanity-check).

#### 5.3.6.3.1 Basic RADIUS Server Configuration

To conduct a basic RADIUS server configuration, add sections to "users" and "clients.conf" files.

User File Example

```
radius_user Cleartext-Password := "radius_user_password"
        Management-Privilege-Level := <15,7,1>
```

Client File Example

```
client client_name {
        ipaddr          = 10.1.2.3
        secret          = radius-secret
}
# Or as  CIDR block such as:
client 10.0.0.0/8 {
        secret          = testing-radius
}
```

#### 5.3.6.3.2 How To Set Up Basic FreeRADIUS Server

1. Run the following command in a Debian machine or other similar Linux distributions.

   ```
   sudo apt-get update
   sudo apt-get install freeradius -y
   ```

2. Add your client IP to `/etc/freeradius/3.0/clients.conf` file as:

   ```
   client client_name {
           ipaddr          = <CLIENT_IP>
           secret          = mysecret
   }
   ```

   or use CIDR block:

   ```
   client 10.0.0.0/8 {
           secret          = global-secret
   }
   ```

3. Add your required radius users to `/etc/freeradius/3.0/users` file as:

   ```
   radius_admin_user Cleartext-Password := "radius_password"
           Management-Privilege-Level := 15

   radius_monitor_user Cleartext-Password := "radius_password"
           Management-Privilege-Level := 7

   radius_non_priv_user Cleartext-Password := "radius_password"
           Management-Privilege-Level := 1
   ```

4. Reboot freeRADIUS service (and make sure it is running).

```
sudo service freeradius restart
sudo service freeradius status
```

5. Configure RADIUS client to use such server.

```
admin@nvos:~$ nv set system aaa radius server <radius-server-ip> secret radius-secret
admin@nvos:~$ nv set system aaa authentication order radius,local
admin@nvos:~$ nv config apply -y
```

6. Login with configured users.

### 5.3.6.4 Required RADIUS Client Configuration

After you install the required RADIUS packages, configure the following required settings on the switch (the RADIUS client):

- Set the IP address or hostname of at least one RADIUS server. You can specify a port for the server (optional). The default port number is 1812.
- Set the secret key shared between the RADIUS server and client. If you include special characters in the key (such as $), you must enclose the key in single quotes (').
- If you use NVUE commands to configure RADIUS, you must also:
    - Set the priority at which NVOS contacts a RADIUS server for load balancing. You can set a value between 1 and 8. The lower value is the higher priority.

The following example commands set:

- The IP address of the RADIUS server to 192.168.0.254 and the port to 42.
- The secret to `'myradius$key'`.
- The priority at which NVOS contacts the RADIUS server to 1.
- The authentication order so that RADIUS authentication has priority over local.

```
admin@nvos:~$ nv set system aaa radius server 192.168.0.254 port 42
admin@nvos:~$ nv set system aaa radius server 192.168.0.254 secret 'myradius$key'
admin@nvos:~$ nv set system aaa radius server 192.168.0.254 priority 1
admin@nvos:~$ nv set system aaa authentication order radius,local
admin@nvos:~$ nv config apply
```

### 5.3.6.5 Optional RADIUS Configuration

You can configure the following global RADIUS settings and server specific settings.

| Setting | Description |
|---|---|
| `retransmit` | The maximum number of retransmission attempts allowed for requests when a RADIUS authentication request times out. This is a global option only; you cannot set the number of retransmission attempts for specific RADIUS servers. |
| `timeout` | The timeout value when a server is slow or latencies are high. You can set a value between 1 and 60. The default timeout is 3 seconds. If you configure multiple RADIUS servers, you can set a global timeout for all servers. |
| `auth-type` | RADIUS autherntication type to use. |

| Setting | Description |
| --- | --- |
| `statistics` | Global confiugration to record RADIUS statistics. |

The following example configures global RADIUS settings:

```
admin@nvos:~$ nv set system aaa radius retransmit 8
admin@nvos:~$ nv set system aaa radius timeout 10
admin@nvos:~$ nv set system aaa radius auth-type chap
admin@nvos:~$ nv set system aaa radius statistics enabled
admin@nvos:~$ nv config apply
```

The following example configures RADIUS settings for a specific RADIUS server:

```
admin@nvos:~$ nv set system aaa radius server 192.168.0.254 port 1811
admin@nvos:~$ nv set system aaa radius server 192.168.0.254 retransmit 5
admin@nvos:~$ nv set system aaa radius server 192.168.0.254 auth-type chap
admin@nvos:~$ nv set system aaa radius server 192.168.0.254 timeout 10
admin@nvos:~$ nv config apply
```

### 5.3.6.6 Show RADIUS Configuration

To show global RADIUS configuration, run the `nv show system aaa radius` command:

```
admin@nvos:~$ nv show system aaa radius
             operational  applied
----------   -----------  --------
port         1812         1812
auth-type    mschapv2     mschapv2
timeout      5            5
retransmit   0            0
statistics   disabled     disabled
[server]     192.168.0.254  192.168.0.254
```

To show all RADIUS configured servers, run the `nv show system aaa radius server` command:

```
admin@nvos:~$ nv show system aaa radius server
Server         Port  Priority  Password   Timeout
-------------  ----  --------  --------   -------
192.168.0.254  42    1         *          10
```

To show configuration for a specific RADIUS server, run the `nv show system aaa radius server <server>` command:

```
admin@nvos:~$ nv show system aaa radius server 192.168.0.254
           operational   applied
---------  ------------  ------------
port       42            42
timeout    10            10
secret     *             *
priority   1             1
```

### 5.3.6.7 Considerations

- If two or more RADIUS users log in simultaneously, a UID lookup only returns the user that logs in first. Any process that either user runs applies to both, and all files that either user creates apply to the first name matched. This process is similar to adding two local users to the password file with the same UID and GID, and is an inherent limitation of using the UID for the fixed user from the password file. The current algorithm returns the first name matching the UID from the mapping file, which is either the first or second user that logs in.

- When you install both the TACACS+ and the RADIUS AAA client, NVOS does not attempt the RADIUS login. As a workaround, do not install both the TACACS+ and the RADIUS AAA client on the same switch.
- When the RADIUS server is reachable outside of the management VRF, such as the default VRF, you might see the following error message when you try to run `sudo`:

```
2008-10-31T07:06:36.191359+00:00 SW01 sudo: pam_radius_auth(sudo:auth): Bind for server 10.1.1.25 failed: Cannot
assign requested address
2008-10-31T07:06:36.192307+00:00 sw01 sudo: pam_radius_auth(sudo:auth): No valid server found in configuration
file /etc/pam_radius_auth.conf
```

The error occurs because `sudo` tries to authenticate to the RADIUS server through the management VRF. Before you run `sudo`, you must set the shell to the correct VRF:

```
admin@nvos:~$ vrf exec default bash
admin@nvos:~$ sudo
```

## 5.3.6.8 RADIUS Commands

- RADIUS Commands

## 5.3.6.9 RADIUS Commands


- 5.3.6.9.1 nv show system aaa radius
- 5.3.6.9.2 nv show system aaa radius server
- 5.3.6.9.3 nv show system aaa radius server id
- 5.3.6.9.4 nv set system aaa radius server
- 5.3.6.9.5 nv set system aaa radius auth-port
- 5.3.6.9.6 nv set system aaa radius auth-type
- 5.3.6.9.7 nv set system aaa radius retransmit
- 5.3.6.9.8 nv set system aaa radius secret
- 5.3.6.9.9 nv set system aaa radius statistics
- 5.3.6.9.10 nv set system aaa radius timeout
- 5.3.6.9.11 nv set system aaa radius server auth-port
- 5.3.6.9.12 nv set system aaa radius server auth-type
- 5.3.6.9.13 nv set system aaa radius server secret
- 5.3.6.9.14 nv set system aaa radius server priority
- 5.3.6.9.15 nv set system aaa radius server retransmit
- 5.3.6.9.16 nv set system aaa radius server timeout


### 5.3.6.9.1 nv show system aaa radius

| | |
|---|---|
| | nv show system aaa radius<br>Display RADIUS features configuration and state. |
| Syntax Description | N/A |
| Default | N/A |

| | |
|---|---|
| History | 25.02.2002<br>25.02.3000 Updated command output |
| Example | |

```
admin@nvos:~$ nv show system aaa radius
           operational  applied
----------  -----------  ----------
port        1812         1812
auth-type   chap         chap
timeout     5            5
secret      *            *
retransmit  0            0
statistics  disabled     disabled
[server]                 10.7.1.131
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/radius |
| Related Commands | |
| Notes | |

## 5.3.6.9.2 nv show system aaa radius server

| | |
|---|---|
| | nv show system aaa radius server<br>Show remote RADIUS servers. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command syntax |
| Example | |

```
admin@nvos:~$ nv show system aaa radius server
Hostname    Auth port  Auth type  secret  Priority  Retransmit  Timeout
----------  ---------  ---------  --------  --------  -----------  -------
1.1.1.1     1812       pap        *         5         0            3
10.7.34.20  1812       pap        *         1         0            3
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/radius/hostname |
| Related Commands | nv show system aaa radius |
| Notes | |

## 5.3.6.9.3 nv show system aaa radius server id

| | | |
|---|---|---|
| | nv show system aaa radius server<server-id><br>Display RADIUS server configuration. | |
| Syntax Description | server-id | RADIUS server ID: ipv4, ipv4-unicas, idn-hostname, ipv6 |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | | |

```
admin@nvos:~$ nv show system aaa radius server 10.7.34.20
          operational  applied
--------  -----------  -------
secret                 *
priority               1
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/radius/server/<server-id> |

| | |
|---|---|
| Related Commands | nv show system aaa radius server<br>nv show system aaa radius |
| Notes | |

### 5.3.6.9.4 nv set system aaa radius server

| | | |
|---|---|---|
| | nv set system aaa radius server <server-id><br>Configure remote RADIUS servers. | |
| Syntax Description | server-id | RADIUS server ID: ipv4, ipv4-unicas, idn-hostname, ipv6 |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | | |

```
admin@nvos:~$ nv set system aaa radius server 1.2.3.4

          operational  applied
--------  -----------  -------
secret                 *
priority               1
```

| | |
|---|---|
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/server/<server-id> |
| Related Commands | nv show system aaa radius server <server-id><br>nv show system aaa radius server<br>nv show system aaa radius |
| Notes | |

### 5.3.6.9.5 nv set system aaa radius auth-port

| | | |
|---|---|---|
| | nv set system aaa radius auth-port <1-65535><br>Configure global RADIUS authentication port. | |
| Syntax Description | auth-port | Integer: 1-65535 |
| Default | 1812 | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set system aaa radius auth-port 1813
```

| | |
|---|---|
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/auth-port |
| Related Commands | nv show system aaa radius |
| Notes | |

### 5.3.6.9.6 nv set system aaa radius auth-type

| | | |
|---|---|---|
| | nv set system aaa radius auth-type <pap \| chap><br>Configure global authentication type. | |
| Syntax Description | auth-type | enum: chap, pap |
| Default | pap | |

| | |
|---|---|
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv set system aaa radius auth-type chap` |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/auth-type |
| Related Commands | nv show system aaa radius |
| Notes | |

### 5.3.6.9.7 nv set system aaa radius retransmit

| | | |
|---|---|---|
| | nv set system aaa radius retransmit <0-10><br>Configure the default RADIUS retransmit tries. | |
| Syntax Description | retransmit | integer: 0-10 |
| Default | 0 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa radius retransmit 2` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/retransmit | |
| Related Commands | nv show system aaa radius | |
| Notes | | |

### 5.3.6.9.8 nv set system aaa radius secret

| | | |
|---|---|---|
| | nv set system aaa radius secret <string \| prompt><br>Configure global radius server secret in cleartext. | |
| Syntax Description | secret | string, prompt |
| Default | "" | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa radius secret Radius-secret` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/secret | |
| Related Commands | nv show system aaa radius | |
| Notes | | |

### 5.3.6.9.9 nv set system aaa radius statistics

| | | |
|---|---|---|
| | nv set system aaa radius statistics <enabled \| disabled><br>Enable/disable log RADIUS statistics. | |
| Syntax Description | statistics | enum: enabled, disabled |
| Default | Disabled | |

| | |
|---|---|
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv set system aaa radius statistics enabled` |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/statistics |
| Related Commands | nv show system aaa radius |
| Notes | |

### 5.3.6.9.10 nv set system aaa radius timeout

| | | |
|---|---|---|
| | nv set system aaa radius timeout <1-60><br>Configure the global RADIUS server reply timeout (seconds). | |
| Syntax Description | timeout | Integer: 1-60 |
| Default | 3 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system aaa radius timeout 5` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/timeout | |
| Related Commands | nv show system aaa radius | |
| Notes | | |

### 5.3.6.9.11 nv set system aaa radius server auth-port

| | | |
|---|---|---|
| | nv set system aaa radius server <server-id> auth-port <1-65535><br>Configure RADIUS authentication port for server. | |
| Syntax Description | server-id | RADIUS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | auth-port | Integer: 1-65535 |
| Default | None (set by RADIUS global config) | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system aaa radius server 1.2.3.4 auth-port 2812` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/server/<server-id>/auth-port/<auth-port> | |
| Related Commands | nv show system aaa radius server <server-id><br>nv show system aaa radius server<br>nv show system aaa radius | |
| Notes | | |

### 5.3.6.9.12 nv set system aaa radius server auth-type

| | | |
|---|---|---|
| | nv set system aaa radius server <server-id> auth-type <pap \| chap><br>Configure RADIUS authentication type for server. | |
| Syntax Description | server-id | RADIUS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | auth-type | Enum: pap, chap |
| Default | None (set by RADIUS global config) | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system aaa radius server 1.2.3.4 auth-type chap` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/server/<server-id>/auth-type/<auth-type> | |
| Related Commands | nv show system aaa radius server <server-id><br>nv show system aaa radius server<br>nv show system aaa radius | |
| Notes | | |

### 5.3.6.9.13 nv set system aaa radius server secret

| | | |
|---|---|---|
| | nv set system aaa radius server <server-id> secret <secret><br>Configure server secret in cleartext. | |
| Syntax Description | server-id | RADIUS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | secret | string, prompt |
| Default | None (set by RADIUS global config) | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system aaa radius server 1.2.3.4 secret Radius-Server-secret` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/server/<server-id>/secret/<secret> | |
| Related Commands | nv show system aaa radius server <server-id><br>nv show system aaa radius server<br>nv show system aaa radius | |
| Notes | | |

### 5.3.6.9.14 nv set system aaa radius server priority

| | | |
|---|---|---|
| | nv set system aaa radius server <server-id> priority <1-8><br>Configure RADIUS priority for server | |
| Syntax Description | server-id | RADIUS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | priority | Integer: 1-8 |
| Default | 1 | |

| | |
|---|---|
| History | 25.02.2002<br>25.02.3000 Updated command syntax |
| Example | `admin@nvos:~$ nv set system aaa radius server 1.2.3.4 priority 5` |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/server/<server-id>/priority/<priority-value> |
| Related Commands | nv show system aaa radius server <server-id><br>nv show system aaa radius server<br>nv show system aaa radius |
| Notes | |

### 5.3.6.9.15 nv set system aaa radius server retransmit

| | | |
|---|---|---|
| | nv set system aaa radius server <server-id> retransmit <1-10><br>Configure the RADIUS retransmit tries for server. | |
| Syntax Description | server-id | RADIUS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | retransmit | Integer: 1-10 |
| Default | None (set by RADIUS global config) | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system aaa radius server 1.2.3.4 retransmit 5` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/server/<server-id>/retransmit/<retransmit-value> | |
| Related Commands | nv show system aaa radius server <server-id><br>nv show system aaa radius server<br>nv show system aaa radius | |
| Notes | | |

### 5.3.6.9.16 nv set system aaa radius server timeout

| | | |
|---|---|---|
| | nv set system aaa radius server <server-id> timeout <1-60><br>Configure the reply timeout for a RADIUS server (seconds). | |
| Syntax Description | server-id | RADIUS server ID: ipv4, ipv4-unicast, idn-hostname, ipv6 |
| | timeout | Integer: 1-60 |
| Default | None (set by RADIUS global config) | |
| History | 25.02.2002<br>25.02.3000 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system aaa radius server 1.2.3.4 timeout 5` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/radius/server/<server-id>/timeout/<timeout-value> | |

| | |
|---|---|
| Related Commands | nv show system aaa radius server <server-id><br>nv show system aaa radius server<br>nv show system aaa radius |
| Notes | |

## 5.3.7 Role Based Access Control


- 5.3.7.1 Default Roles
- 5.3.7.2 Custom Roles
  - 5.3.7.2.1 Elements of Custom Role-Based Access Control
  - 5.3.7.2.2 Example Role Permissions
- 5.3.7.3 Assign a Custom Role to a User Account
- 5.3.7.4 Delete Custom Roles
- 5.3.7.5 Show Custom Role Information
- 5.3.7.6 Role Based Access Control Commands


The product features a Role-Based Access Control (RBAC) mechanism to manage user permissions effectively. This system ensures that users have access only to the functions necessary for their roles, enhancing both security and operational efficiency. The product supports two static roles: admin and monitor.

### 5.3.7.1 Default Roles

- The admin role has full access to all system configurations and management functionalities.
- The monitor role provides read-only access, allowing users to view system information and monitor operations without making any changes.

### 5.3.7.2 Custom Roles

Users can define new accounts with one of the available roles and modify the role of existing users as needed.

```
admin@nvos:~$ nv set system aaa user new_monitor role monitor
```

The roles of the default accounts (admin and monitor) cannot be changed

In addition to the default roles that NVOS provides, you can create your own roles to restrict authorization, giving you more granular control over what a user can manage on the switch. For example, you can assign a user the role of network manager and provide the user privileges for interface management, service management and system management. When the user logs in and executes an NVUE command, NVUE checks the user privileges and authorizes the user to run that command.

### 5.3.7.2.1 Elements of Custom Role-Based Access Control

Custom role-based access control consists of the following elements:

| Element | Description |
|---|---|
| Role | A virtual identifier for multiple classes (groups). You can assign only one role for a user. For example, for a user that can manage interfaces, you can create a role called `IBMgr`. |
| Class | A class is similar in concept to a Linux group. Creating and managing classes is the simplest way to configure multiple users simultaneously, especially when configuring permissions.<br><br>A class consists of:<br>• Command paths, which NVOS bases on the objects in the NVUE declarative model and, which are the same as URI paths; for example; you can use the `/interface/` command path to allow or deny a user access to all interfaces, or `/system/ntp` to allow or deny a user access to ntp configuration. Use the tab key to see available command paths ( `nv set system aaa class <class-name> command-path / <<press tab>>` ).<br>• Permissions for the command paths: ( `ro` ) to run show commands, ( `rw` ) to run set, unset, and apply commands, ( `act` ) to run action commands, or ( `all` ) to run all commands. The default permission setting is `all`. |
| Action | The action for the class: `allow` or `deny`. |

- You can assign a maximum of 64 classes to a role.
- You can configure a maximum of 128 command paths for a class.
- When you configure a command path, you allow or deny a specific schema path and its children. For example the command path `/interface/` allows or denies access to all interface commands, whereas the command path `/interface/eth0` allows or denies access to eth0 commands.

### 5.3.7.2.2 Example Role Permissions

The following example describes the permissions for a role ( `role1` ) that consists of three classes: `class1`, `class2`, `class3`.

class1 has the `allow` class action and the following command path permissions:

| Command Path | Permissions |
|---|---|
| `/interface/` | `all` |
| `/ib/` | ro |

class2 has the `allow` class action and the following command path permissions:

| Command Path | Permissions |
|---|---|
| `/system/` | `ro` |
| `/ib/` | `act` |
| /vrf/ | rw |

class3 has the `deny` class action and the following command path permissions:

| Command Path | Permissions |
|---|---|
| `/interface/eth0/` | ro |

The following table shows the permissions for a user assigned the role `role1`. In the table, R is read only (RO), W is write, and X is action (ACT).

| Path | Allow | Deny | Permissions |
|---|---|---|---|
| `/platform/` | | RWX | Implicit deny |
| `/acl/` | | RWX | Implicit deny |
| All unspecified paths are implicit deny | | | |
| `/interface/` | RWX | | The permissions specified |
| `/interface/eth0` | | RWX | The permissions specified |
| All unspecified children of `/interface/` inherit parent permissions | RWX | | |
| All unspecified children of `/interface/eth0` inherit parent permissions | | RWX | |
| `/system/` | R | WX | The permissions specified |
| `/system/aaa/` | R | WX | Inherited from parent |
| `/system/cpu/` | R | WX | Inherited from parent |
| All unspecified children of `/system/` inherit parent permissions | R | WX | |
| /ib/ | RX | W | The permissions specified |
| /ib/ibdiagnet | RX | W | Inherited from parent |
| `/vrf/` | RW | X | The permissions specified |
| All unspecified children of `/vrf/` inherit parent permissions | RW | X | |

### 5.3.7.3 Assign a Custom Role to a User Account

To assign a custom role to a user account:

1. Create a role and classes for the role.
2. Assign the action (allow or deny) for each class.
3. Add command paths and permissions for each class.
4. Assign a role to a user.

You assign a custom role to an existing user account.

The following example creates and assigns the three classes described above for role `role1`.

`class1` has permissions to manage all interfaces and to show all the tree of ib:

```
admin@nvos:~$ nv set system aaa role role1 class class1
admin@nvos:~$ nv set system aaa class class1 action allow
admin@nvos:~$ nv set system aaa class class1 command-path /interface/ permission all
admin@nvos:~$ nv set system aaa class class1 command-path /ib/ permission ro
admin@nvos:~$ nv config apply
```

`class2` has permissions to show system commands, perform actions on ib cmd and show and set configuration of vrf:

```
admin@nvos:~$ nv set system aaa role role1 class class2
admin@nvos:~$ nv set system aaa class class2 command-path /system/ permission ro
admin@nvos:~$ nv set system aaa class class2 command-path /ib/ permission act
admin@nvos:~$ nv set system aaa class class2 command-path /vrf/ permission rw
admin@nvos:~$ nv config apply
```

`class3` denies permission of `ro` on eth0 interface, this explicit definition on the child causes it to stop inheriting the parent read and action permissions.

```
admin@nvos:~$ nv set system aaa class class3 action deny
admin@nvos:~$ nv set system aaa class class3 command-path /interface/eth0/ permission ro
admin@nvos:~$ nv set system aaa role role1 class class3
admin@nvos:~$ nv config apply
```

The following command assigns user `ib_user` the role `role1`:

```
admin@nvos:~$ nv set system aaa user ib_user role role1
admin@nvos:~$ nv config apply
```

### 5.3.7.4 Delete Custom Roles

To delete a custom role and all its classes, you must first unassign the role from the user, then delete the role:

```
admin@nvos:~$ nv unset system aaa user ib_user role role1
admin@nvos:~$ nv unset system aaa role role1
admin@nvos:~$ nv config apply
```

To delete a class from a role, run the `nv unset system aaa role <role> class <class>` command:

```
admin@nvos:~$ nv unset system aaa role role1 class class2
admin@nvos:~$ nv config apply
```

### 5.3.7.5 Show Custom Role Information

To show the user accounts configured on the system, run the NVUE `nv show system aaa user` command.

```
admin@nvos:~$ nv show system aaa user
Username  Full-name             Role     state
--------  --------------------  -------  -------
admin     System Administrator  admin    enabled
ib_user                         role1    enabled
monitor   System Monitor        monitor  enabled
```

To show information about a specific user account including the role assigned to the user, run the NVUE `nv show system aaa user <user>` command:

```
admin@nvos:~$ nv show system aaa user ib_user
                    operational  applied
------------------  -----------  -------
state               enabled      enabled
role                role1        role1
full-name
password            *            *
hashed-password     *
ssh
  [authorized-key]
```

To show all the roles configured on the switch, run the NVUE `nv show system aaa role` command:

```
admin@nvos:~$ nv show system aaa role
Role Name  Class
---------  --------
admin      nvaction
           nvapply
           sudo
monitor    nvshow
role1      class1
           class2
           class3
```

To show the classes applied to specific role, run the `nv show system aaa role <role>` command:

```
admin@nvos:~$ nv show system aaa role role1
         operational                applied
-------  -----------------------    -------
groups   adm,class1,class2,class3
[class]  class1                     class1
[class]  class2                     class2
[class]  class3                     class3
```

To show all the classes configured on the switch, run the `nv show system aaa class` command:

```
admin@nvos:~$ nv show sys aaa class
Class Name  Command Path      Permission  Action
----------  ----------------  ----------  ------
class1      /ib/              ro          allow
            /interface/       all
```

```
class2      /ib/              act         allow
            /system/          ro
            /vrf/             rw
class3      /interface/eth0/  all         deny
nvaction    /                 act         allow
nvapply     /                 rw          allow
nvshow      /                 ro          allow
sudo        /                 all         allow
```

To show the configuration and state of the command paths for a class, run the `nv show system aaa class <class>` command:

```
admin@nvos:~$ nv show system aaa class class3
              applied
--------------  ----------------
action          deny
[command-path]  /interface/eth0/
```

## 5.3.7.6 Role Based Access Control Commands

- Role Based Access Control Commands

## 5.3.7.7 Role Based Access Control Commands


- 5.3.7.7.1 nv show system aaa role
- 5.3.7.7.2 nv show system aaa role id
- 5.3.7.7.3 nv show system aaa class
- 5.3.7.7.4 nv show system aaa class id
- 5.3.7.7.5 nv show system aaa class id command-path
- 5.3.7.7.6 nv set/unset system aaa class action
- 5.3.7.7.7 nv set/unset system aaa class command-path
- 5.3.7.7.8 nv unset system aaa class
- 5.3.7.7.9 nv set/unset system aaa role class
- 5.3.7.7.10 nv unset system aaa role


### 5.3.7.7.1 nv show system aaa role

| | |
|---|---|
| | nv show system aaa role<br>Displays list of roles (user capabilities) and their groups. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.3000 |
| Example | <br>`admin@nvos:~$ nv show system aaa role`<br>`Role Name  Class`<br>`---------  --------`<br>`admin  nvaction`<br>`  nvapply`<br>`  sudo`<br>`monitor  nvshow` |
| REST API | GET https://<ip>/nvue_v1/system/aaa/role |

| | |
|---|---|
| Related commands | nv show system aaa role monitor<br>nv show system aaa role <role-id><br>nv set system aaa role <role-id> class <class-id> |
| Notes | • admin—full administrative capabilities<br>• monitor—read only capabilities, can not change the running configuration |

### 5.3.7.7.2 nv show system aaa role id

| | | |
|---|---|---|
| | nv show system aaa role <role-id><br>Displays configuration of a role. | |
| Syntax Description | role-id | The name of the role (i.e., admin, monitor) |
| Default | N/A | |
| History | 25.02.3000 | |
| Example | admin@nvos:~$ nv show system aaa role role1<br><br>admin@nvos:~$ nv show system aaa role monitor<br>operational applied<br>------- ----------- -------<br>groups adm,nvshow<br>[class] nvshow nvshow | |
| REST API | GET https://<ip>/nvue_v1/system/aaa/role/{role-id} | |
| Related commands | nv show system aaa role<br>nv set system aaa role <role-id> class <class-id> | |
| Notes | admin—full administrative capabilities<br>monitor—read only capabilities, cannot change the running configuration | |

### 5.3.7.7.3 nv show system aaa class

| | | |
|---|---|---|
| | nv show system aaa class<br>Display all Classes configuration and state. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.3000 | |
| Example | admin@nvos:~$ nv show system aaa class<br>Class Name Command Path Permission Action<br>---------- ------------ ---------- ------<br>nvaction / act allow<br>nvapply / rw allow<br>nvshow / ro allow<br>sudo / all allow | |
| REST API | GET https://<ip>/nvue_v1/system/aaa/class | |
| Related Commands | nv set system aaa class <class-id> command-path <command-path-id><br>nv set system aaa class <class-id> action <arg> | |
| Notes | | |

### 5.3.7.7.4 nv show system aaa class id

| | | |
|---|---|---|
| | nv show system aaa class <class-id><br>Display configuration and state of a class. | |
| Syntax description | class-id | The name of the class. |
| Default | N/A | |
| History | 25.02.3000 | |
| Example | | |

```
admin@nvos:~$ nv show sys aaa class nvshow
                applied
--------------  -------
action          allow
[command-path]  /
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/class/{class-id} |
| Related Commands | nv set system aaa class <class-id> command-path <command-path-id><br>nv set system aaa class <class-id> action <arg><br>nv show system aaa class |
| Notes | |

### 5.3.7.7.5 nv show system aaa class id command-path

| | | |
|---|---|---|
| | nv show system aaa class <class-id> command-path [<command-path-id>]<br>Display configuration and state of a class command-paths. | |
| Syntax description | class-id | The name of the class |
| | command-path-id | The command path (e.g., /interface/eth0) |
| Default | N/A | |
| History | 25.02.3000 | |
| Example | | |

```
admin@nvos:~$ nv show sys aaa class nvshow command-path
Command Path  Permission
------------  ----------
/             ro
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/aaa/class/{class-id}/command-path/{command-path-id} |
| Related Commands | nv set system aaa class <class-id> command-path <command-path-id><br>nv set system aaa class <class-id> action <arg><br>nv show system aaa class |
| Notes | |

### 5.3.7.7.6 nv set/unset system aaa class action

| | |
|---|---|
| | nv set system aaa class <class-id> action <arg><br>nv unset system aaa class <class-id> action<br>Set the action to be taken upon getting a match on the command paths.<br>Unset the action to be taken upon getting a match on the command paths. |

| | | |
|---|---|---|
| Syntax Description | class-id | The name of the class |
| | arg | The action to be taken upon getting a match on the command paths<br>enum: allow, deny |
| Default | action: allow | |
| History | 25.02.3000 | |
| Example | `admin@nvos:~$ nv set system aaa class ib_enjoyer action allow` | |
| REST API | N/A | |
| Related Commands | | |
| Notes | | |

### 5.3.7.7.7 nv set/unset system aaa class command-path

| | | |
|---|---|---|
| | nv set system aaa class <class-id> command-path [<command-path-id>] [permission <permission>]<br>nv unset system aaa class <class-id> command-path [<command-path-id>] [permission]<br>Configure command paths for classes.<br>The unset form of the command clears command paths under classes. | |
| Syntax Description | class-id | The name of the class |
| | command-path-id | The command path (e.g., /interface/eth0) |
| | permission | The permissions on the command path<br>enum: ro, rw, act, all |
| Default | permission: all | |
| History | 25.02.3000 | |
| Example | `admin@nvos:~$ nv set system aaa class class3 command-path /interface/eth0/ permission all` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/class/{class-id}/command-path/{command-path-id} | |
| Related Commands | nv set system aaa class <class-id> action <arg> | |
| Notes | | |

### 5.3.7.7.8 nv unset system aaa class

| | | |
|---|---|---|
| | nv unset system aaa class [<class-id>]<br>Clear class configuration. | |
| Syntax Description | class-id | The name of the class |
| Default | N/A | |
| History | 25.02.3000 | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv unset system aaa class ib_enjoyer` |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/class/{class-id} |
| Related Commands | nv set system aaa class <class-id> command-path <command-path-id><br>nv set system aaa class <class-id> action |
| Notes | A class cannot be unset if it is a part of a role. |

### 5.3.7.7.9 nv set/unset system aaa role class

| | | |
|---|---|---|
| | nv set system aaa role {<role-id> class <class-id>}<br>nv unset system aaa role {<role-id> class [<class-id>]}<br>Configure classes under role.<br>The unset form of the command clears classes under role. | |
| Syntax Description | role-id | The name of the role |
| | class-id | The name of the class |
| Default | N/A | |
| History | 25.02.3000 | |
| Example | `admin@nvos:~$ nv set system aaa role role1 class class3` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/role/{role-id}/class/{class-id} | |
| Related Commands | nv set system aaa class <class-id> action <arg><br>nv set system aaa class <class-id> command-path <command-path-id><br>nv set/unset system aaa user role | |
| Notes | | |

### 5.3.7.7.10 nv unset system aaa role

| | | |
|---|---|---|
| | nv unset system aaa role <role-id><br>Clear role's configuration. | |
| Syntax Description | role-id | The name of the role |
| Default | N/A | |
| History | 25.02.3000 | |
| Example | `admin@nvos:~$ nv unset system aaa role role1` | |
| REST API | PATCH https://<ip>/nvue_v1/system/aaa/role/{role-id}/ | |
| Related Commands | nv set system aaa role <role-id> class <class-id> | |
| Notes | A role cannot be unset if it is a part of a user. | |

## 5.3.8 Authorization

Authorization defines the capabilities, privileges, and available commands for a specific user within the system.

Remote user authorization defines the user's permission level through server configuration, as specified by the remote AAA server.

The Authorization section supports configuring when user authorization is derived from the AAA server.

> ⚠ Currently, remote authorization is supported only when TACACS is used.

```
admin@nvos:~$ nv set sys aaa authorization mode session-remote
# or
admin@nvos:~$ nv set sys aaa authorization mode first-login
```

Default mode: first-login

- session-remote—The user's permission level is validated and updated from the AAA server each time they log in (per session).
- first-login—The user's permission level is retrieved from the AAA server only during the first login and is then cached for subsequent logins.

### 5.3.8.1 Authorization Commands

- Authorization Commands

### 5.3.8.2 Authorization Commands

#### 5.3.8.2.1 nv show system aaa authorization

| | |
|---|---|
| | nv show system aaa tacacs authorization<br>Show authorization configuration. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.5026 |
| Example | `admin@nvos:~$ nv show system aaa authorization`<br>`  operational  applied`<br>`----  --------------  --------------`<br>`mode  session-remote  session-remote` |
| REST API | GET https://<ip>/nvue_v1/system/aaa/authorization |
| Related Commands | nv set system aaa authorization mode |
| Notes | This configuration applies only when TACACS authentication is configured. It does not affect RADIUS or LDAP. |

#### 5.3.8.2.2 nv set system aaa authorization mode

| | | |
|---|---|---|
| | nv set system aaa authorization mode <authorization-mode><br>Sets system authorization mode. | |
| Syntax Description | authorization-mode | enum: first-login-remote, session-remote |
| Default | first-login-remote | |
| History | 25.02.5026 | |
| Example | `admin@nvos:~$ nv set system aaa authorization mode` | |
| REST API | SET https://<ip>/nvue_v1/system/aaa/authorization/mode | |
| Related commands | nv show sys aaa authorization | |
| Notes | This configuration applies only when TACACS authentication is configured. It does not affect RADIUS or LDAP. | |

## 5.4 Certificates Management


- 5.4.1 Import Certificate
  - 5.4.1.1 CA Certificate
  - 5.4.1.2 Import Certificate
- 5.4.2 Set the Certificate to Use in NVUE REST API
- 5.4.3 Set the Certificate to Use for GNMI Service
- 5.4.4 Delete Certificates
- 5.4.5 Show Certificate Information
- 5.4.6 Certificate Management Commands


NVOS includes a self-signed certificate and private key to use on the server so that it works out of the box. The switch generates the self-signed certificate and private key when it boots for the first time. The X.509 certificate with the public key is in `/etc/ssl/certs/nvue.pem` and the corresponding private key is in `/etc/ssl/private/nvue.key`.

NVIDIA recommends you use your own certificates and keys.

NVOS lets you manage CA certificates (such as DigiCert or Verisign) and entity (end-point) certificates. Both a CA certificate and an entity certificate can contain a chain of certificates. The CA certificates can be also addressed as trust bundles, which means that CA certs can also include intermediate certificates.

You can import certificates onto the switch (fetch certificates from an external source), set which certificate you want to use for the NVUE REST API, gNMI, NMX, and show information about a certificate, such as the serial number, and the date and time during which the certificate is valid.

NVOS uses OpenSSL 3, which does not support legacy ciphers by default. Ensure all certificates and keys use modern algorithms (e.g., SHA-256, RSA, ECDSA) and avoid deprecated ones such as MD5, SHA1, RC2-40-CBC, RC4, and DES.

### 5.4.1 Import Certificate

- A maximum of 25 entity certificates and a maximum of 25 CA certificates can be imported
  - A single CA certificate entry may contain up to 100 PEM strings and may also include intermediate certificates.
- The imported server/entity certificate contains sensitive private key information. NVIDIA recommends that you use a secure transport such as SFTP, SCP, or HTTPS.
- To import an entity certificate, run an nv action import system security certificate <cert-id> command.
- To import a CA certificate, run an nv action import system security ca-certificate <cert-id> command.

If the certificate is passphrase protected, the passphrase to be included.

You must provide a certificate ID (<cert-id>) to uniquely identify the certificate you import.

#### 5.4.1.1 CA Certificate

The following example imports a CA certificate with a public key and calls the certificate tls-cert-1. The public key is a Base64 ASCII encoded PEM string.

```
nvos@switch:~$ nv action import system security ca-certificate tls-cert-1 data """-----BEGIN CERTIFICATE----- TODO
----END CERTIFICATE-----"""
```

The following example imports a CA certificate with a public key and calls the certificate `tls-cert-1` with URI `scp://user@pass:1.2.3.4:/opt/certs/ca-cert.crt`.

```
nvos@switch:~$ nv action import system security ca-certificate tls-cert-1 uri scp://user@pass:1.2.3.4:/opt/certs/
ca-cert.crt
```

The following example imports a CA certificate with a public key and calls the certificate `tls-cert-1` with URI `scp://user@pass:1.2.3.4:/opt/certs/ca-cert.crt`. External makes CA certificate standalone, which means certificate is not attached to common system CA certificates bundle in `/etc/ssl/certs/ca-certificates.crt`.

```
nvos@switch:~$ nv action import system security ca-certificate tls-cert-1 uri scp://user@pass:1.2.3.4:/opt/certs/
ca-cert.crt external
```

#### 5.4.1.2 Import Certificate

The following example imports an entity certificate bundle (public + private key) and calls the certificate tls-cert-1. The certificate bundle is passphrase protected with mypassphrase.

A certificate bundle must be in .p12 format.

To generate a certificate bundle with the .p12 format, use the following command:

```
openssl pkcs12 -export -out $cert_filename.p12 -in $cert_filename.pem -inkey $cert_filename.key -passout pass:
$p12_pass
```

Example of importing the.p12 boundle file:

```
nvos@switch:~$ nv action import system security certificate tls-cert-1 passphrase mypassphrase uri-bundle scp://
user@pass:1.2.3.4:/opt/certs/cert.p12
```

The following example imports an entity certificate bundle and calls the certificate tls-cert-local. The certificate is located on top of the local machine under `/home/admin` path:

```
nv action import system security certificate tls-cert-local uri-public-key file://127.0.0.1/home/admin/cert.crt
uri-private-key file://127.0.0.1/home/admin/cert.key

#Using absolute path is also possible. Example:
nv action import system security certificate tls-cert-local uri-public-key file:///home/admin/cert.crt uri-private-
key file:///home/admin/cert.key
```

The following example imports an entity certificate with the public key URI `scp://user@pass:1.2.3.4` and private key URI `scp://user@pass:1.2.3.4`, and calls the certificate `tls-cert-1`. The certificate is not passphrase protected.

```
nvos@switch:~$ nv action import system security certificate tls-cert-1 uri-public-key scp://user@pass:1.2.3.4 uri-
private-key scp://user@pass:1.2.3.4
```

## 5.4.2 Set the Certificate to Use in NVUE REST API

> ⚠ When updating a new CA/Certificate/CRL, make sure to perform the "nv config save" before proceeding with a reboot.

You can configure the NVUE REST API to use a specific certificate.

The following example configures the API to use the certificate tls-cert-1:

```
nvos@switch:~$ nv set system api certificate tls-cert-1
nvos@switch:~$ nv config apply
```

The following example configures the API to use the self-signed certificate:

```
nvos@switch:~$ nv set system api certificate self-signed
nvos@switch:~$ nv config apply
```

To unset the certificate to use with the NVUE REST API:

```
nvos@switch:~$ nv unset system api certificate tls-cert-1
```

## 5.4.3 Set the Certificate to Use for GNMI Service

You can configure the GNMI to use a specific certificate.

The following example configures the API to use the certificate tls-cert-1:

```
nvos@switch:~$ nv set system gnmi-server certificate tls-cert-1
```

```
nvos@switch:~$ nv config apply
```

The following example configures the API to use the self-signed certificate:

```
nvos@switch:~$ nv set system gnmi-server certificate self-signed
nvos@switch:~$ nv config apply
```

To unset the certificate to use with the NVUE REST API:

```
nvos@switch:~$ nv unset system gnmi-server certificate tls-cert-1
```

### 5.4.4 Delete Certificates

- To delete an entity certificate and the key data stored on the switch, run the nv action delete system security certificate <cert-id> command.
- To delete a CA certificate and the key data stored on the switch, run the nv action delete system security ca-certificate <cert-id> command.

The following command deletes the certificate tls-cert-1:

```
nvos@switch:~$ nv action delete system security certificate tls-cert-1
```

### 5.4.5 Show Certificate Information

- To show all the entity certificates on the switch, run the nv show system security certificate command.
- To show all the CA certificates on the switch, run the nv show system security ca-certificate command.

The following example shows all the entity certificates on the switch:

```
nvos@switch:~$ nv show system security certificate
```

- To show the applications that are using a specific entity certificate, run the nv show system security certificate <cert-id> installed command.
- To show the applications that are using a specific CA certificate, run the nv show system security ca-certificate <cert-id> installed command.

The following example shows the applications that are using a specific entity certificate.

```
nvos@switch:~$ nv show system security certificate tls-cert-1 installed
```

- To show detailed information about a specific entity certificate, run the nv show system security certificate <cert-id> dump command.
- To show detailed information about a specific CA certificate, run the nv show system security ca-certificate <cert-id> dump command.

The following example shows detailed information about the CA certificate tls-cert-1:

```
nvos@switch:~$ nv show system security ca-certificate tls-cert-1 dump
```

## 5.4.6 Certificate Management Commands

- Certificate Management Commands

## 5.4.7 Certificate Management Commands


- 5.4.7.1 nv show system security ca-certificate
- 5.4.7.2 nv show system security certificate
- 5.4.7.3 nv action delete system security ca-certificate
- 5.4.7.4 nv action delete system security certificate
- 5.4.7.5 nv action import system security ca-certificate
- 5.4.7.6 nv action import system security certificate


### 5.4.7.1 nv show system security ca-certificate

| | |
|---|---|
| | nv show system security ca-certificate<br>Display owned CA certificates. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |
| Example | admin@nvos:~$ nv show system security ca-certificate<br>Certificate ID Serial Number Valid From Valid To Summary<br>---------- ---------- ---------- ---------- ----------<br>ca_id_168 43:69:66:63:11:75:31:00:95:03:96: 2025-02-18T16:06:37+02:00 2026-02-18T16:06:37+02:00 count: 1<br><br>Installed: nvue-rest-api |
| REST API | GET https://<ip>/nvue_v1/system/security/ca-certificate/ |
| Related Commands | nv action import system security ca-certificate {cacert id} |
| Notes | |

### 5.4.7.2 nv show system security certificate

| | |
|---|---|
| | nv show system security certificate<br>Display owned certificates. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv show system security certificate`<br>`Certificate ID  Serial Number  Valid From  Valid To  Summary`<br>`--------  --------  --------  --------  --------`<br>`cert_id_396  5A:A6:4C:4A:8C:B8:9A:89:8  2025-02-18T16:06:37+02:00  2026-02-18T16:06:37+02:00  Installed: nvue-rest-api`<br>`Installed:  gnmi-server` |
| REST API | GET https://<ip>/nvue_v1/system/security/ca-certificate/ |
| Related Commands | nv action import system security certificate {cacert id} |
| Notes | |

## 5.4.7.3 nv action delete system security ca-certificate

| | | |
|---|---|---|
| | nv action delete system security ca-certificate <cacert-id><br>Delete system security CA certificate. | |
| Syntax Description | cacert-id | CA certificate ID removed during import |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv action delete system security ca-certificate {cacert id}` | |
| REST API | DELETE https://<ip>/nvue_v1/system/security/ca-certificate/{cacert id} | |
| Related Commands | nv action import system security ca-certificate {cacert id} | |
| Notes | | |

## 5.4.7.4 nv action delete system security certificate

| | | |
|---|---|---|
| | nv action delete system security certificate <cert-id><br>Delete system security CA certificate. | |
| Syntax Description | cert-id | Certificate ID removed during import |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv action delete system security certificate {cert id}` | |
| REST API | DELETE https://<ip>/nvue_v1/system/security/certificate/{cert id} | |
| Related Commands | nv action import system security certificate {cert id} | |
| Notes | | |

### 5.4.7.5 nv action import system security ca-certificate

| | | |
|---|---|---|
| | nv action import system security ca-certificate <cacert-id> <uri {remote-url} \| data> <remote-url \| cacert-data> [external-ca]<br>Import system security CA certificate bundle. | |
| Syntax Description | cacert-id | Unique CA Certificate ID that was named by the user |
| | uri | A local/remote URI from where the certificate file (containing the public-key) can be retrieved.<br>Supports: ftp, scp and sftp<br>(e.g., scp://user[:password]@hostname/path/filename, file:///absolute-path/filename) |
| | data | The raw data bytes (e.g., PEM string) of the CA certificates bundle. |
| | remote-url | A local/remote URI from where the certificate file (containing the CA certificate bundle) can be retrieved. |
| | external_ca | Optional parameter to import certificate without appending it to system CA certificates bundle at `/etc/ssl/certs/ca-certificates.crt`. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv action import system security ca-certificate tls-cert-1 uri scp://
user:pass@1.2.3.4:/ca-cert.crt
```

```
admin@nvos:~$ nv action import system security ca-certificate tls-cert-1 uri file:///ca-
cert.crt
```

```
admin@nvos:~$ nv action import system security ca-certificate tls-cert-1 data "<CA-
certificate>"
```

```
admin@nvos:~$ nv action import system security ca-certificate tls-cert-1 uri scp://
user:pass@1.2.3.4:/ca-cert.crt external
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/security/ca-certificate/{cacert-id} |
| Related Commands | nv action delete system security ca-certificate {cacert-id}<br>nv show sys security ca-certificate |
| Notes | |

### 5.4.7.6 nv action import system security certificate

| | | |
|---|---|---|
| | nv action import system security certificate <cert-id> <uri-public-key <uri-path> uri-private-key <uri-path> \| uri-bundle <uri-path> [passphrase] \| data><br>Import system security certificate. | |
| Syntax Description | cert-id | Unique Certificate ID that was named by the user |
| | uri-public-key | A local/remote URI from where the public key file can be retrieved. |
| | uri-private-key | A local/remote URI from where the private key file can be retrieved. |

| | | |
|---|---|---|
| | uri-bundle | A local/remote URI from where the certificate file containing the certificate bundle can be retrieved.<br>Needs to be in .p12 format. |
| | uri-path | A local/remote URI from where the certificate file (containing the CA certificate bundle) can be retrieved. |
| | data | The raw data bytes (e.g., PEM string) of the certificates bundle |
| | passphrase | Optional passphrase if certificate bundle is passphrase protected |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv action import system security certificate tls-cert-1 passphrase
mypassphrase uri-bundle scp://user:pass@1.2.3.4:/opt/certs/cert.p12
```

```
admin@nvos:~$ nv action import system security certificate tls-cert-1 passphrase
mypassphrase uri-bundle file:///opt/certs/cert.p12
```

```
admin@nvos:~$ nv action import system security certificate tls-cert-1 uri-public-key scp:/
/user:pass@1.2.3.4:/opt/certs/public uri-private-key scp://user:pass@1.2.3.4:/opt/certs/
private
```

```
admin@nvos:~$ nv action import system security certificate tls-cert-1 uri-public-key file:/
//opt/certs/public uri-private-key file:///opt/certs/private
```

```
admin@nvos:~$ nv action import system security certificate tls-cert-1 data "<CA-
certificate>"
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/security/certificate/{cert-id} |
| Related Commands | nv action delete system security certificate<br>nv show sys security certificate |
| Notes | |

# 5.5 Control and Power

NVOS allows to perform actions such as rebooting the system, initiating a power-cycle, and retrieving information about past reboots.

## 5.5.1 Possible Reboot Causes

- "Power Loss"
- "Thermal Overload: CPU"
- "Thermal Overload: ASIC"
- "Thermal Overload: Other"
- "Insufficient Fan Speed"
- "Watchdog"
- "Hardware - Other"
- "BIOS"

- "CPU"
- "Long push button"
- "Short push button"
- "Reset from ASIC"

> ⚠ Operations like firmware installation (nv action install platform firmware files) may change the behavior of the next system reboot to do a full power-cycle to apply the newly burned firmware.

## 5.5.2 Control and Power Commands

- Control and Power Commands

## 5.5.3 Control and Power Commands


- 5.5.3.1 nv show system reboot
- 5.5.3.2 nv show system reboot reason
- 5.5.3.3 nv show system reboot history
- 5.5.3.4 nv action reboot system
- 5.5.3.5 nv show platform ps-redundancy
- 5.5.3.6 nv set platform ps-redundancy policy


### 5.5.3.1 nv show system reboot

| | |
|---|---|
| | nv show system reboot<br>Show system reboot information. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>admin@nvos:~$ nv show system reboot<br><br>operational applied<br>--- --- ---<br>[history]<br>reason<br>gentime 2022_06_02_07_32_05<br>reason Hardware - Other (Reset from ComEx)<br>user N/A |
| REST API | GET https://<ip>/nvue_v1/system/reboot |
| Related commands | |
| Notes | |

### 5.5.3.2 nv show system reboot reason

| | |
|---|---|
| | nv show system reboot reason<br>Show the system reboot reason. |

| | |
|---|---|
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show system reboot reason`<br>`  operational  applied`<br>`-------  ----------  -------`<br>`gentime  2022_06_02_07_32_05`<br>`reason  Hardware - Other (Reset from ComEx)`<br>`user  N/A` |
| REST API | GET https://<ip>/nvue_v1/system/reboot/reason |
| Related commands | |
| Notes | |

### 5.5.3.3 nv show system reboot history

| | |
|---|---|
| | nv show system reboot history<br>Show the system reboot history. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show system reboot history`<br>`  gentime  reason  user`<br>`--  ----------  ----------  ----`<br>`1  2022_06_02_07_32_05  Hardware - Other (Reset from ComEx)  N/A` |
| REST API | GET https://<ip>/nvue_v1/system/reboot/history |
| Related commands | |
| Notes | |

### 5.5.3.4 nv action reboot system

| | | |
|---|---|---|
| | nv action reboot system [mode {halt \| cold \| immediate}] [force]<br>Reboot switch system. | |
| Syntax Description | flag | • halt: Shuts down the system<br>• cold: Allow a controlled shutdown by notifying all running processes that the system is going down<br>• immediate: Reboot system immediately without notifying any running processes |
| | force | Force the action without asking for user confirmation. |
| Default | N/A | |
| History | 25.02.2002<br>25.02.5002 Updated reboot modes | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv action reboot system`<br>`Configuration has been modified, but not saved.`<br>`Type [y] to reboot the system without saving configuration.`<br>`Type [N] to abort.`<br><br>`Do you want to continue? [Y/N] N`<br>`System reboot aborted by user`<br><br>`admin@nvos:~$ nv action reboot system mode halt`<br>`Type [y] to halt the system.`<br>`Type [N] to abort.`<br>`WARNING: This operation will shut down the system.`<br>`You will NOT be able to turn on the system remotely.`<br><br>`Do you want to continue? [y/N]` |
| REST API | POST https://<ip>/nvue_v1/system |
| Related commands | nv action install platform firmware files |
| Notes | • The prompt will be displayed only if there is unsaved configuration on the switch. Otherwise, the reboot will be performed as usual.<br>• Using the halt flag will show the prompt unless force flag is passed.<br>• Using the immediate flag will not trigger the firmware upgrade flow that part of normal reboot.<br>• If the switch is in a fatal state, it will exit that state once it comes up.<br>• `nv action reboot system` will still work as usual which is equivalent to `nv action reboot system mode cold` |

## 5.5.3.5 nv show platform ps-redundancy

| | |
|---|---|
| | nv show platform ps-redundancy<br>Shows power supply redundancy policy |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show platform ps-redundancy`<br><br>`  operational  applied`<br>`-------  --------------  --------------`<br>`policy  grid-redundant  grid-redundant`<br>`min-required  8` |
| REST API | GET https://<ip>/nvue_v1/platform/ps-redundancy |
| Related Commands | nv set platform ps-redundancy policy<br>nv show system health |
| Notes | Supported only in systems that do not require all the power supplies to be connected. |

## 5.5.3.6 nv set platform ps-redundancy policy

| | | |
|---|---|---|
| | nv set platform ps-redundancy policy {no-redundancy \| ps-redundant \| grid-redundant}<br>Sets system power redundancy policy. When the power redundancy policy requirements are not met a health issue is raised | |
| Syntax Description | no-redundancy | No power supply is reserved. The redundancy is not enabled. |

| | | |
|---|---|---|
| | ps-redundant | One power supply unit is redundant to the rest. The system can work with one less power supply unit. |
| | grid-redundant | The power supplies are split into two logical power supply grids, each grid contains the minimum power supplies required by the system. The power supplies on the left side of the switch are one grid, and the power supplies on the right switch are the other. The system can work if all the power supplies of one grid fail. |
| Default | grid-redundant | |
| History | 25.02.2002 | |
| Example | nv set platform ps-redundancy policy grid-redundant | |
| REST API | PATCH https://<ip>/nvue_v1/ platform/ps-redundancy | |
| Related Commands | nv show system health<br>nv show platform ps-redundancy | |
| Notes | Supported only in systems that do not require all the power supplies to be connected. | |

# 5.6 DNS Server

Domain Name System (DNS) is an essential component of modern networking, translating human-readable domain names into IP addresses that systems can understand. Proper DNS configuration ensures seamless connectivity and efficient resolution of network requests.

NVOS provides an ability to manage DNS servers, allowing users to add, configure, and view DNS server configurations as needed.

## 5.6.1 Supported Configurations and Limitations

- Both IPv4 and IPv6 unicast DNS server addresses configurations are supported
- NVOS obtains dynamic DNS entries from DHCP server by default (this will be preserved if no static DNS entries are configured)
- Dynamic DNS configuration will not work if management interface uses static IP configuration
- Linux allows for a maximum of three DNS servers to be configured at the same time

## 5.6.2 DNS Server Commands

- DNS Server Commands

## 5.6.3 DNS Server Commands


- 5.6.3.1 nv show system dns
- 5.6.3.2 nv show system dns server
- 5.6.3.3 nv set/unset system dns server

### 5.6.3.1 nv show system dns

| | | |
|---|---|---|
| | nv show system dns<br>Display DNS configuration. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show system dns<br><br>operational applied<br>-------- ----------- -----------<br>[server] 8.8.8.8 8.8.8.8<br>[server] 10.7.77.135 10.7.77.135<br>[server] 10.7.77.192 10.7.77.192 | |
| REST API | GET https://<ip>/nvue_v1/system/dns | |
| Related Commands | nv show system dns server<br>nv set/unset system dns server | |
| Notes | | |

### 5.6.3.2 nv show system dns server

| | | |
|---|---|---|
| | nv show system dns server<br>Display list of configured DNS servers. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show system dns server<br><br>DNS Server<br>-----------<br>8.8.8.8<br>10.7.77.135<br>10.7.77.192 | |
| REST API | GET https://<ip>/nvue_v1/system/dns/server | |
| Related Commands | nv set/unset system dns server | |
| Notes | | |

### 5.6.3.3 nv set/unset system dns server

| | | |
|---|---|---|
| | nv set system dns server {dns-server-ip}<br>nv unset system dns server {dns-server-ip}<br>Update the DNS server configuration. | |
| Syntax Description | dns-server-ip | IPv4 or IPv6 unicast address of a DNS server |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv set system dns server 249.1.1.1`<br>`Error: '249.0.0.0' is not a 'dns-server-ip-address'. IP address must be unicast IPv4/IPv6 address.`<br><br>`admin@nvos:~$ nv set system dns server 8.8.8.8`<br>`admin@nvos:~$ nv set system dns server 1.1.1.1`<br>`admin@nvos:~$ nv set system dns server 10.7.77.192`<br>`admin@nvos:~$ nv set system dns server 10.7.77.135`<br>`admin@nvos:~$ nv config apply`<br>`The maximum number 3 of DNS servers exceeded.`<br><br>`admin@nvos:~$ nv unset system dns server 10.7.77.135`<br>`admin@nvos:~$ nv unset system dns server`<br>`admin@nvos:~$ nv unset system dns` |
| REST API | PATCH https://<ip>/nvue_v1/system/dns/server/{dns-server-ip} |
| Related Commands | nv show system dns server |
| Notes | The maximum number of DNS servers is limited to three by Linux. |

# 5.7 Documentation

Users can view and upload any of the documentation files provided by the NVOS as part of its release, including the EULA, User Manual, Release Notes, and Open Source Licenses.

## 5.7.1 Documentation Commands

- Documentation Commands

## 5.7.2 Documentation Commands


- 5.7.2.1 nv show system documentation
- 5.7.2.2 nv action upload system documentation files


### 5.7.2.1 nv show system documentation

| | | |
|---|---|---|
| | nv show system documentation<br>Display system document list. | |
| Syntax Description | files | Displays system document list in brief mode. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv show system documentation`<br>`Name  Type  Path`<br>`------------------------  --------------------`<br>`----------`<br>`NVOS_EULA.pdf  EULA  /usr/share/nginx/html/system_documents/eula/NVOS_EULA.pdf`<br>`NVOS_NVL_Release_Notes.pdf  Release notes  /usr/share/nginx/html/system_documents/release_notes/NVOS_NVL_Release_Notes.pdf`<br>`NVOS_NVL_User_Manual.pdf  User manual  /usr/share/nginx/html/system_documents/user_manual/NVOS_NVL_User_Manual.pdf`<br>`Open_Source_Licenses.txt  Open source licenses  /usr/share/nginx/html/system_documents/open_source_licenses/Open_Source_Licenses.txt` | |
| Related Commands | nv action upload system documentation files | |

| | |
|---|---|
| Notes | |

### 5.7.2.2 nv action upload system documentation files

| | | |
|---|---|---|
| | nv action upload system documentation files <file-name> <remote-url><br>Upload system document to remote server | |
| Syntax Description | file-name | Document to be uploaded. |
| | remote-url | Destination image file name<br>Remote url path to upload a file to.<br>Format: [protocol]://username[:password]@hostname/path/filename<br>Supported protocols: SCP, FTP, SFTP, and HTTPS |
| Default | N/A | |
| History | 25.02.2002<br>25.02.4002: Added HTTPS support in remote-url | |
| Example | admin@nvos:~$ nv action upload system documentation files NVOS_EULA.pdf scp://user:password@10.1.12.20/tmp/NVOS_EULA.pdf | |
| Related Commands | nv show system documentation | |
| Notes | | |

## 5.8 Hostname

NVOS provides the ability to set a hostname to the switch. Make sure that the hostname is unique and descriptive.
There are two option to set the hostname: Dynamically through DHCP or Statically in NVUE.

### 5.8.1 Hostname from DHCP

By default, DHCP is enabled, device receives the DHCP Hostname option inside the response and set the device hostname.

By default, DHCP is enabled for both interfaces that may receive hostname update during run. NVOS is always updating to the latest hostname received by DHCP.
It is possible to disable hostname for a certain interface by executing the following:

```
admin@nvos:~$ nv set interface eth0 ip dhcp-client set-hostname disabled
admin@nvos:~$ nv config apply
```

> ⚠ Do not use an underscore (_), apostrophe ('), or non-ASCII characters in the hostname.
>
> The hostname convention need to follow "idn-hostname" as defined by either RFC 1123 as for hostname, or an internationalized hostname as defined by RFC 5890, section 2.3.2.3 [RFC5890]

## 5.8.2 Static Hostname

To change the hostname, run the following:

```
admin@nvos:~$ nv set system hostname leaf01
admin@nvos:~$ nv config apply
```

> The command prompt in the terminal does not reflect the new hostname until either logging out of the switch or starting a new shell.

## 5.8.3 Hostname Commands

- Hostname Commands

## 5.8.4 Hostname Commands

### 5.8.4.1 nv set/unset system hostname

| | | |
|---|---|---|
| | nv set/unset system hostname {hostname}<br>Set/unset the hostname of the switch. | |
| Syntax Description | hostname | The new hostname to set |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system hostname switch01<br>admin@nvos:~$ nv unset system hostname | |
| REST API | PATCH https://<ip>/nvue_v1/system | |
| Related Commands | nv show system | |
| Notes | | |

# 5.9 Link Layer Discovery Protocol

Link Layer Discovery Protocol (LLDP) is a standard protocol that lets network devices share basic information (such as name, port, and capabilities) with directly connected neighbors. It helps with network discovery and troubleshooting without affecting traffic.

In NVOS, LLDP is supported on management ports only.

## 5.9.1 LLDP State

To check LLDP state, run the following command:

```
admin@nvos:~$ nv show system lldp

                        operational   applied
------------------      -----------   -------
state                   enabled       enabled
tx-interval             30            30
tx-hold-multiplier      4             4
```

## 5.9.2 LLDP Neighbor Information

To check LLDP neighbor informaion, run the following command:

```
admin@nvos:~$ nv show interface eth0 lldp neighbor
Neighbor                      Remote IP    Model    SW Version        Remote Port
-------------------------     ----------   -------  ----------------  -----------
MTL-S-F2-LAB-ADVG-SW-4-12     10.60.4.12                              11
```

## 5.9.3 LLDP Commands

- Link Layer Discovery Protocol Commands

## 5.9.4 Link Layer Discovery Protocol Commands

### 5.9.4.1 nv set/unset system lldp

| | | |
|---|---|---|
| | nv set system lldp [state {enabled,disabled} \| tx-interval {number} \| tx-hold-multiplier {number}]<br>nv unset system lldp [state {enabled,disabled} \| tx-interval {number} \| tx-hold-multiplier {number}]<br>Update LLDP global configurations. | |
| Syntax Description | state | LLDP state configuration. |
| | tx-interval | Change transmit delay. |
| | tx-hold-multiplier | TTL of transmitted packets is calculated by multiplying the tx-interval by the given factor. |
| Default | state | enabled |
| | tx-interval | 30 |
| | tx-hold-multiplier | 4 |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system lldp state disabled<br>admin@nvos:~# nv set system lldp state tx-interval 50 | |
| REST API | PATCH https://<ip>/nvue_v1/system/lldp | |
| Related Commands | nv show system lldp | |
| Notes | | |

### 5.9.4.2 nv show system lldp

| | | |
|---|---|---|
| | nv show system lldp<br>Display LLDP global configurations. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show system lldp

                          operational   applied
------------------        -----------   -------
state                     enabled       enabled
tx-interval               30            30
tx-hold-multiplier        4             4
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/lldp |
| Related Commands | nv set system lldp |
| Notes | |

### 5.9.4.3 nv show interface lldp

| | | |
|---|---|---|
| | nv show interface <interface-id> lldp<br>Show preview details of interface neighbor. | |
| Syntax Description | interface-id | interface name |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 lldp
                 operational                        applied
----------       -------------------------          -------
[neighbor]       MTL-S-F2-LAB-ADVG-SW-4-12
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/lldp |
| Related Commands | nv show interface {interface-id} lldp neighbor |
| Notes | This command is just for mgmt interfaces. |

### 5.9.4.4 nv show interface lldp neighbor

| | | |
|---|---|---|
| | nv show interface <interface-id> lldp neighbor<br>Show details of interface neighbor. | |
| Syntax Description | interface-id | interface name |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show interface eth0 lldp neighbor
Neighbor                      Remote IP    Model    SW Version        Remote Port
-------------------------     ----------   -------  ----------------  -----------
MTL-S-F2-LAB-ADVG-SW-4-12     10.60.4.12                              11
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/lldp/neighbor |
| Related Commands | nv show interface <interface-id> lldp neighbor <neighbor-id> |
| Notes | This command is just for mgmt interfaces. |

## 5.9.4.5 nv show interface lldp neighbor id

| | | |
|---|---|---|
| | nv show interface <interface-id> lldp neighbor <neighbor-id><br>Show extend details of the neighbor | |
| Syntax Description | interface-id | Interface name |
| | neighbor-id | Neighbor name |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 lldp neighbor MTL-S-F2-LAB-ADVG-SW-4-12
                          operational
-------------------------  ----------------------------------------------------
age                        3581
bridge
  untagged                 59
chassis
  chassis-id               1c:98:ec:45:3e:c0
  management-address-ipv4  10.60.4.12
  management-address-ipv6  fdfd:fdfd:7:145::1000:4998
  system-name              MTL-S-F2-LAB-ADVG-SW-4-12
  system-description       HP J9775A 2530-48G Switch, revision YA.16.11.0015, ROM YA.15.
20 ...
port
  ttl                      120
  name                     11
  type                     local
  description              11
  pmd-autoneg
    [advertised]           0
    [advertised]           1
    [advertised]           2
    mau-oper-type          1000BaseTFD - Four-pair Category 5 UTP, full duplex mode

lldp-med
  device-type
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/lldp/neighbor/{neighbor-id} |
| Related Commands | nv show interface {interface-id} lldp neighbor |
| Notes | This command is just for mgmt interfaces. |

## 5.9.4.6 nv show interface lldp

| | | |
|---|---|---|
| | nv show interface lldp<br>Show neighbor details of all interfaces. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv show interface lldp`<br>`Interface  Speed  Type  Neighbor  Remote Port`<br>`---------  ------  --------  ----------  -----------`<br>`eth0  1G  eth  MTL-S-F2-LAB-ADVG-SW-4-12  11`<br>`ib0  ipoib`<br>`lo  loopback`<br>`sw1p1  200G  ib`<br>`sw1p2  200G  ib`<br>`sw2p1  ib`<br>`...  ...` |
| REST API | GET https://<ip>/nvue_v1/interface/lldp |
| Related Commands | nv show interface {interface-id} lldp |
| Notes | |

# 5.10 Management Interfaces

Management interfaces are used in order to provide access to switch management user interfaces (e.g., CLI, openAPI).

NVIDIA switches support out-of-band (OOB) dedicated interfaces (e.g., eth0). In addition, most NVIDIA switches feature a serial port that provides access to the CLI only.

## 5.10.1 Configuring Management Interfaces with Static IP Addresses

The management interface uses DHCP for addressing by default.

To set a static IP address (for example):

```
admin@nvos:~$ nv set interface eth0 ip address 192.0.2.42/24
admin@nvos:~$ nv set interface eth0 ip gateway 192.0.2.1
admin@nvos:~$ nv config apply
```

> To help setups with static IP to detect new devices, configuring static IP address will trigger unsolicited announcement messages to the gateway in order to reveal the devices's MAC address. This also applies to static IPv6 addresses.
> Physically disconnecting and connecting the cables will also trigger the same messages when static IP addresses are configured.

## 5.10.2 Configuring IPv6 Address on the Management Interface

1. Set a static IPv6 address. Run:

```
admin@nvos:~$ nv set interface eth0 ip address fdfd:fdfd:7:145:9a03:9bff:fe6b:6ac/64
admin@nvos:~$ nv config apply
```

2. Verify the IPv6 address is configured correctly. Run:

```
admin@nvos:~$ nv show interface eth0
```

## 5.10.3 Default Gateway

To configure manually the default gateway, use the “nv set interface eth0 ip gateway” command, with “0.0.0.0” as prefix and mask. The next-hop address must be within the range of one of the IP interfaces on the system.

## 5.10.4 IP DHCP Client

To enable DHCP client and DHCPv6 client state on Management (eth0, eth1) interfaces use the following commands:

1. nv set interface <interface-id> ip dhcp-client state <enabled | disabled>
2. nv set interface <interface-id> ip dhcp-client6 state <enabled | disabled>

> Enabling DHCP client on management interface (eth0, eth1) automatically enables DHCPv6 client and vice-versa.

## 5.10.5 Management Interface Commands


- 5.10.5.1 nv show interface
- 5.10.5.2 nv show interface link
- 5.10.5.3 nv set/unset interface link connection-mode
- 5.10.5.4 nv show interface ip
- 5.10.5.5 nv set/unset interface link state
- 5.10.5.6 nv set/unset interface description
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- 5.10.5.9 nv set/unset interface link mtu
- 5.10.5.10 nv set/unset interface link speed
- 5.10.5.11 nv set/unset interface link duplex
- 5.10.5.12 nv set interface link auto-negotiate
- 5.10.5.13 nv set interface ip autoconf
- 5.10.5.14 nv set interface ip gateway
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- 5.10.5.17 VRF
  - 5.10.5.17.1 nv show vrf
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- 5.10.5.18 IP DHCP Client
  - 5.10.5.18.1 nv set interface ip dhcp-client state
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  - 5.10.5.18.5 nv action renew interface ip dhcp-client

- 5.10.5.18.6 nv action renew interface ip dhcp-client6

### 5.10.5.1 nv show interface

| | | |
|---|---|---|
| | nv show interface [interface-id]<br>Displays details of an IPoIB/eth0 interface. If not interface is selected, summary of attributes of all interfaces will be displayed. | |
| Syntax Description | interface-id | Name of the interface to display (e.g., eth0) |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000: Updated command output | |

Example

```
admin@nvos:~$ nv show interface ib0
                          operational
applied
-----------------------   ------------------------------------------------------------
--------
ip
  arp-timeout             1800
1800
  autoconf                disabled
disabled
  dhcp-client
    state                 disabled
disabled
    set-hostname          enabled
enabled
    is-running            no
    has-lease             no
  dhcp-client6
    state                 disabled
disabled
    set-hostname          enabled
enabled
    is-running            no
    has-lease             no
  [gateway]
link
  auto-negotiate                                                                      on
  duplex
full
  speed
auto
  mac                     80:00:00:02:fe:80:00:00:00:00:00:00:90:0a:84:03:00:76:a8:00
  counters
    in-bytes              72 Bytes
    in-pkts               1
    in-drops              0
    in-errors             0
    out-bytes             480 Bytes
    out-pkts              4
    out-drops             0
    out-errors            0
    carrier-transitions   2
  mtu                     2044
2044
  state                   up                                                          up
ifindex                   8
type                      ipoib
ipoib
```

```
admin@nvos:~$ nv show interface
Interface  State  Speed  MTU    Type      Description  IB speed  IB subnet
Logical state  Physical state  Summary
---------  -----  -----  -----  --------  -----------  --------  ------------------
-------------  --------------  ------------------------------------------------
eth0       up     1G     1500   eth
ip.address:                          10.7.89.7/20

ip.address: fdfd:fdfd:7:80:eaeb:d3ff:fe4b:70b8/64
ib0        up            2044   ipoib
lo         up            65536  loopback
ip.address:                          127.0.0.1/16

ip.address:                                ::1/128
sw1p1      down                ib                                 infiniband-default  Down
Polling
sw1p2      down                ib                                 infiniband-default  Down
Polling
sw2p1      down                ib                                 infiniband-default  Down
Polling
. . .
sw32p1     up     400G   4096   ib                     ndr       infiniband-default
Active         LinkUp
sw32p2     up     400G   4096   ib                     ndr       infiniband-default
Active         LinkUp
```

```
admin@nvos:~$ nv show interface eth0

                          operational                          applied
-----------------------   ---------------------------------
---------------------------------
[acl]                     ACL_MGMT_INBOUND_CP_DEFAULT          ACL_MGMT_INBOUND_CP_DEFAULT
[acl]                     ACL_MGMT_INBOUND_CP_DEFAULT_IPV6
ACL_MGMT_INBOUND_CP_DEFAULT_IPV6
[acl]                     ACL_MGMT_INBOUND_DEFAULT             ACL_MGMT_INBOUND_DEFAULT
[acl]                     ACL_MGMT_INBOUND_DEFAULT_IPV6        ACL_MGMT_INBOUND_DEFAULT_IPV6
[acl]                     ACL_MGMT_OUTBOUND_CP_DEFAULT         ACL_MGMT_OUTBOUND_CP_DEFAULT
[acl]                     ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6
ACL_MGMT_OUTBOUND_CP_DEFAULT_IPV6
lldp
  [neighbor]
ip
  vrf                     default                              default
  arp-timeout             1800                                 1800
  autoconf                enabled                              enabled
  dhcp-client
```

```
    state                 enabled                           enabled
    set-hostname          enabled                           enabled
    is-running            yes
    has-lease             no
  dhcp-client6
    state                 enabled                           enabled
    set-hostname          enabled                           enabled
    is-running            no
    has-lease             no
  [gateway]
link
  auto-negotiate          on                                on
  duplex                                                    full
  speed                                                     1G
  mac                     c4:70:bd:8f:51:32
  counters
    in-bytes              0 Bytes
    in-pkts               0
    in-drops              0
    in-errors             0
    out-bytes             0 Bytes
    out-pkts              0
    out-drops             0
    out-errors            0
    carrier-transitions   1
  mtu                     1500                              1500
  state                   down                              up
ifindex                   2
type                      eth                               eth
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface |
| Related Commands | nv set interface<br>nv show interface |
| Notes | |

## 5.10.5.2 nv show interface link

| | | |
|---|---|---|
| | nv show interface <interface-id> link {brief \| counters \| state }<br>Displays link information of an IPoIB/eth0 interface. | |
| Syntax Description | interface-id | Name of the interface to display (e.g., eth0) |
| | state | Show only the data relating to state |
| | stats | Show only the data relating to statistics |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000: Updated command output | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show interface ib0 link counters

                    operational
------------------  -----------
in-bytes            0 Bytes
in-pkts             0
in-drops            0
in-errors           0
out-bytes           0 Bytes
out-pkts            0
out-drops           0
out-errors          0
carrier-transitions 1
```

```
admin@nvos:~$ nv show interface eth0 link
                      operational        applied
---------------------  -----------------  -------
auto-negotiate         on                 on
duplex                                    full
speed                                     1G
mac                    c4:70:bd:8f:51:32
counters
  in-bytes             0 Bytes
  in-pkts              0
  in-drops             0
  in-errors            0
  out-bytes            0 Bytes
  out-pkts             0
  out-drops            0
  out-errors           0
  carrier-transitions  1
mtu                    1500               1500
state                  down               up
```

```
admin@nvos:~$ nv show interface eth0 link state
    operational  applied
--  -----------  -------
    up
```

```
admin@nvos:~$ nv show interface eth0 link counters
                    operational
------------------  -----------
in-bytes            4.20 MB
in-pkts             5561
in-drops            0
in-errors           0
out-bytes           1.42 MB
out-pkts            2942
out-drops           0
out-errors          0
carrier-transitions 5
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/<interface-id>/link |
| Related Commands | nv show interface<br>nv set interface link<br>nv unset interface link |
| Notes | |

## 5.10.5.3 nv set/unset interface link connection-mode

| | | |
|---|---|---|
| | nv set interface <interface-id> link connection-mode {value}<br>nv unset interface <interface-id> link connection-mode<br>Change the interface connection-mode value according to his peer connectivity. | |
| Syntax Description | interface-id | Name of the interface to display. |
| | value | The connection-mode values: xdr/ndr |
| Default | XDR | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
$ nv set interface swA1p1 link connection-mode ndr
```

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/interface/{interface-id}/link |
| Related Commands | nv show interface swA1p1 link |
| Notes | This command is only supported on Q3200-RA system. |

## 5.10.5.4 nv show interface ip

| | | |
|---|---|---|
| | nv show interface <interface-id> ip {address \| dhcp-client \| dhcp-client6 \| gateway}<br>Displays IP configuration and state of an IPoIB/eth0 interface. | |
| Syntax Description | interface-id | Name of the interface to display (e.g., ib0, eth0) |
| | address | Display the IP address configuration of an IPoIB/eth0 interface |
| | dhcp-client | Display the DHCPv4 configuration and state of an IPoIB/eth0 interface |
| | dhcp-client6 | Display the DHCPv6 configuration and state of an IPoIB/eth0 interface |
| | gateway | Display the IP gateway configuration of an IPoIB/eth0 interface |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 ip
                operational                           applied
--------------  ------------------------------------  -------
vrf             default                               default
arp-timeout     1800                                  1800
autoconf        enabled                               enabled
dhcp-client
  state         enabled                               enabled
  set-hostname  enabled                               enabled
  is-running    yes
  has-lease     yes
dhcp-client6
  state         enabled                               enabled
  set-hostname  enabled                               enabled
  is-running    yes
  has-lease     no
[address]       10.7.89.7/20
[address]       fdfd:fdfd:7:80:eaeb:d3ff:fe4b:70b8/64
[gateway]
```

```
admin@nvos:~$ nv show interface eth0 ip address

------------------------------------
10.7.144.154/21
fdfd:fdfd:7:145::1000:454c/128
fdfd:fdfd:7:145:ac0:ebff:fe58:7f90/64
```

```
admin@nvos:~$ nv show interface eth0 ip dhcp-client
                operational  applied
------------    -----------  -------
set-hostname    enabled      enabled
state           enabled      enabled
has-lease       yes
is-running      yes
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/<interface-id>/ip |
| Related Commands | nv show interface<br>nv set interface ip<br>nv unset interface ip |

| | |
|---|---|
| Notes | |

### 5.10.5.5 nv set/unset interface link state

| | | |
|---|---|---|
| | nv set interface <interface-id> link state {value}<br>nv unset interface <interface-id> link state {value}<br>Set/unset the administrative link state of a given IPoIB/eth0 interface. | |
| Syntax Description | interface-id | Name of the interface whose link state to set (e.g., eth0) |
| | value | New value for the link state: up, down |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv unset interface ib0 link state`<br>`admin@nvos:~$ nv set interface ib0 link state up`<br><br>`admin@nvos:~$ nv unset interface eth0 link state`<br>`admin@nvos:~$ nv set interface eth0 link state up` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/link/state | |
| Related Commands | nv show interface<br>nv set interface link<br>nv unset interface link state | |
| Notes | | |

### 5.10.5.6 nv set/unset interface description

| | | |
|---|---|---|
| | nv set interface <interface-id> description<br>nv unset interface <interface-id> description<br>Sets the description of a given IPoIB/eth0 interface.<br>The unset form of the command sets the description of a given IPoIB/eth0 interface to empty. | |
| Syntax Description | interface-id | Name of the interface whose link state to set, (e.g. ib0, eth0) |
| | value | New value for the description. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface ib0 description "IPoIB interface"`<br>`admin@nvos:~$ nv unset interface ib0 description`<br><br>`admin@nvos:~$ nv set interface eth0 description "mgmt interface"`<br>`admin@nvos:~$ nv unset interface eth0 description` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id> | |
| Related Commands | nv show interface<br>nv unset interface description | |

| | |
|---|---|
| Notes | |

### 5.10.5.7 nv set/unset interface ip

| | | |
|---|---|---|
| | nv set interface <interface-id> ip address <ip-prefix-id><br>nv unset interface <interface-id> ip address <ip-prefix-id><br>Sets the IP address of a given IPoIB/eth0 interface.<br>The unset form of the command deletes one or more IP addresses assigned to a given IPoIB/eth0 interface. | |
| Syntax Description | interface-id | Name of the interface whose IP address to set (e.g., ib0, eth0) |
| | ip-prefix-id | IP address and netmask to assign to the interface |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface ib0 ip address 10.10.1.1/8`<br>`admin@nvos:~$ nv set interface eth0 ip address 10.10.1.1/8` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip/address | |
| Related Commands | nv show interface<br>nv unset interface ip | |
| Notes | | |

### 5.10.5.8 nv unset interface

| | | |
|---|---|---|
| | nv unset interface <interface-id><br>Sets all attributes of an IPoIB/eth0 interface to default values. | |
| Syntax Description | interface-id | Name of the interface to set to default values (e.g., eth0) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv unset interface eth0` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id> | |
| Related Commands | nv show interface<br>nv set interface | |
| Notes | | |

### 5.10.5.9 nv set/unset interface link mtu

| | | |
|---|---|---|
| | nv set interface <interface-id> link mtu <bytes><br>nv unset interface <interface-id> link mtu<br>Sets the Maximum Transmission Unit (MTU) of this interface.<br>The unset form of the command resets the MTU to its default. | |
| Syntax Description | interface-id | Name of the interface to display (e.g., eth0) |
| | bytes | Range: 1280-9000 |
| Default | 1500 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 link mtu 1500` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/link | |
| Related Commands | nv show interface link | |
| Notes | | |

### 5.10.5.10 nv set/unset interface link speed

| | | |
|---|---|---|
| | nv set interface <interface-id> link speed <speed><br>nv unset interface <interface-id> link speed<br>Sets the interface speed.<br>The unset form of the command resets the speed setting for this interface to its default value. | |
| Syntax Description | interface-id | Name of the interface to display (e.g., eth0) |
| | speed | 10M, 100M, 1000M |
| Default | 1000M | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 link speed 100M` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/link | |
| Related Commands | nv show interface link | |
| Notes | This command is currently not supported in IPoIB interfaces. | |

### 5.10.5.11 nv set/unset interface link duplex

| | | |
|---|---|---|
| | nv set interface <interface-id> link duplex <duplex><br>nv unset interface <interface-id> link duplex<br>Sets the interface duplex.<br>The unset form of the command resets the duplex setting for this interface to its default value. | |
| Syntax Description | interface-id | The interface (e.g., eth0) |

| | | |
|---|---|---|
| | duplex | full, half |
| Default | full | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set interface eth0 link duplex full | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/link | |
| Related Commands | nv show interface link | |
| Notes | This command is currently not supported in IPoIB interfaces. | |

### 5.10.5.12 nv set interface link auto-negotiate

| | | |
|---|---|---|
| | nv set interface <interface-id> link auto-negotiate <auto><br>Sets link speed and characteristic auto negotiation. | |
| Syntax Description | interface-id | The interface (e.g., eth0) |
| | auto | on, off |
| Default | on | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set interface eth0 link auto-negotiate on | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/link | |
| Related Commands | nv show interface link | |
| Notes | This command is currently not supported in IPoIB interfaces. | |

### 5.10.5.13 nv set interface ip autoconf

| | | |
|---|---|---|
| | nv set interface <interface-id> ip autoconf <autoconf><br>IPv6 Stateless Address Autoconfiguration (SLAAC) | |
| Syntax Description | interface-id | The interface |
| | autoconf | enable, disable |
| Default | Enable | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set interface eth0 ip autoconf enable | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip | |
| Related Commands | nv unset interface ip gateway | |
| Notes | | |

### 5.10.5.14 nv set interface ip gateway

| | | |
|---|---|---|
| | nv set interface <interface-id> ip gateway {gateway-ip}<br>Sets default gateway IP address for an interface. | |
| Syntax Description | interface-id | The interface |
| | gateway-ip | The gateway IP address |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 ip gateway 1.1.1.1` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip/gateway | |
| Related Commands | nv show interface ip | |
| Notes | | |

### 5.10.5.15 nv set interface ip arp-timeout

| | | |
|---|---|---|
| | nv set interface <interface-id> ip arp-timeout <time><br>Sets IPv4 arp timeout (in seconds) for an interface. | |
| Syntax Description | interface-id | The interface |
| | time | Seconds. Range: 60-28800 |
| Default | 1800 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 ip arp-timeout 2100` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip | |
| Related Commands | | |
| Notes | | |

### 5.10.5.16 nv set/unset interface link breakout

| | | |
|---|---|---|
| | nv (un)set interface <interface-id> link breakout [mode]<br>Set/unset interface breakout mode. | |
| Syntax Description | interface-id | The interface for which to set breakout. |
| | mode | The breakout mode to set. |
| Default | Disabled | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv set interface sw1p1 link breakout 2x-ndr`<br>`admin@nvos:~$ nv unset interface sw1p1 link breakout` |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip |
| Related Commands | nv action change system profile breakout-mode enabled |
| Notes | • Breakout configuration may only be applied when system profile allows it (i.e., breakout-mode is enabled).<br>• To get the current system profile, run: `nv show system profile`<br>• To enable breakout-mode in system profile, run: `nv action change system profile breakout-mode enabled ...` |

## 5.10.5.17 VRF

### 5.10.5.17.1 nv show vrf

| | | |
|---|---|---|
| | show vrf {vrf-id}{loopback \| loopback ip \| loopback ip address {ip-prefix-id}}<br>Shows VRFs. | |
| Syntax Description | vrf-id | VRF |
| | loopback | Return loopback interface details of a VRF. |
| | loopback ip | Return IP details of a VRF loopback interface. |
| | loopback ip address | Return details of the IP addresses. |
| | ip-prefix-id | IPv4 or IPv6 address and route prefix in CIDR notation |
| | <none> | Shows all VRFs |
| Default | N/A | |
| Configuration Mode | config | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show vrf
Name       Table  Summary
---------  -----  ------------------------
+ default  254    IP Address: 127.0.0.1/8
  default         IP Address:     ::1/128
+ mgmt     1001   IP Address: 127.0.0.1/8
  mgmt            IP Address:     ::1/128
```

```
admin@nvos:~$ nv show vrf mgmt
               operational  applied      description
-------------  -----------  -----------
----------------------------------------------------------------------------
table          1001         auto         The routing table number, between 1001-1255, used
by the named VRF....
evpn
  enable                    off          Turn the feature 'on' or 'off'.  The default is
'off'.
loopback
  ip
    [address]  127.0.0.1/8  127.0.0.1/8  static IPv4 or IPv6 address
    [address]  ::1/128      ::1/128
ptp
  enable                    on           Turn the feature 'on' or 'off'.  The default is
'on'.
router
  bgp
    enable                  off          Turn the feature 'on' or 'off'.  The default is
'off'.
  ospf
    enable                  off          Turn the feature 'on' or 'off'.  The default is
'off'.
  [rib]                                  RIB Routes
  [static]                               Routes
```

```
admin@nvos:~$ nv show vrf mgmt loopback
           operational  applied      description
-----------  -----------  -----------  ---------------------------
ip
  [address]  127.0.0.1/8  127.0.0.1/8  static IPv4 or IPv6 address
  [address]  ::1/128      ::1/128
```

```
admin@nvos:~$ nv show vrf mgmt loopback ip
           operational  applied      description
---------  -----------  -----------  ---------------------------
[address]  127.0.0.1/8  127.0.0.1/8  static IPv4 or IPv6 address
[address]  ::1/128      ::1/128
```

```
admin@nvos:~$ nv show vrf mgmt loopback ip address

-----------
127.0.0.1/8
::1/128
```

```
admin@nvos:~$ nv show vrf mgmt loopback ip address 127.0.0.1/8
    operational  applied  description
--  -----------  -------  -----------
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/vrf/{vrf-id} |
| Related Commands | |
| Notes | FRR must be running to be able to use this command. |

## 5.10.5.17.2 nv set interface ip vrf

| | | |
|---|---|---|
| | nv set interface <interface-id> ip vrf {vrf-name}<br>Assigns an interface to a VRF. | |
| Syntax Description | interface-id | The interface |

| | | |
|---|---|---|
| | vrf-name | The VRF: default/ mgmt |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 ip vrf mgmt` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip | |
| Related Commands | nv unset interface ip vrf | |
| Notes | | |

## 5.10.5.18 IP DHCP Client

### 5.10.5.18.1 nv set interface ip dhcp-client state

| | | |
|---|---|---|
| | nv set interface <interface-id> ip dhcp-client state {enabled \| disabled}<br>nv unset interface <interface-id> ip dhcp-client<br>Enables/disables DHCP client for an interface.<br>The unset form of the command returns the DHCP client to its default state. | |
| Syntax Description | interface-id | The interface |
| Default | Enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 ip dhcp-client state enabled` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip/dhcp-client | |
| Related Commands | nv set interface ip dhcp-client6 state | |
| Notes | Configuring the DHCP client for either IPv4 or IPv6 will set the same configuration for both. | |

### 5.10.5.18.2 nv set interface ip dhcp-client set-hostname

| | | |
|---|---|---|
| | nv set interface <interface-id> ip dhcp-client set-hostname {enabled \| disabled}<br>nv unset interface <interface-id> ip dhcp-client set-hostname<br>Allows/disallows DHCP client to set system hostname from DHCP.<br>The unset form of the command returns the system hostname to its default state. | |
| Syntax Description | interface-id | The interface |
| Default | Enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 ip dhcp-client set-hostname enabled` | |

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip/dhcp-client |
| Related Commands | nv set interface ip dhcp-client6 set-hostname<br>nv set interface ip dhcp-client state |
| Notes | Configuring the DHCP client for either IPv4 or IPv6 will set the same configuration for both. |

### 5.10.5.18.3 nv set interface ip dhcp-client6 state

| | | |
|---|---|---|
| | nv set interface <interface-id> ip dhcp-client6 state {enabled \| disabled}<br>nv set interface <interface-id> ip dhcp-client6<br>Enables/disables DHCPv6 client for an interface.<br>The unset form of the command returns the DHCPv6 client to its original state. | |
| Syntax Description | interface-id | The interface |
| Default | Enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 ip dhcp-client6 state enabled` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip/dhcp-client6 | |
| Related Commands | nv set interface ip dhcp-client state | |
| Notes | Configuring the DHCP client for either IPv4 or IPv6 will set the same configuration for both. | |

### 5.10.5.18.4 nv set interface ip dhcp-client6 set-hostname

| | | |
|---|---|---|
| | nv set interface <interface-id> ip dhcp-client6 set-hostname {enabled \| disabled}<br>nv unset interface <interface-id> ip dhcp-client6 set-hostname<br>Allows/disallows DHCP client to set system hostname from DHCPv6.<br>The unset form of the command returns the DHCP client to its default state. | |
| Syntax Description | interface-id | The interface |
| Default | Enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface eth0 ip dhcp-client6 set-hostname enabled` | |
| REST API | PATCH https://<ip>/nvue_v1/interface/<interface-id>/ip/dhcp-client6 | |
| Related Commands | nv set interface ip dhcp-client set-hostname<br>nv set interface ip dhcp-client6 state | |
| Notes | Configuring the DHCP client for either IPv4 or IPv6 will set the same configuration for both. | |

### 5.10.5.18.5 nv action renew interface ip dhcp-client

| | | |
|---|---|---|
| | nv action renew interface <interface-id> ip dhcp-client<br>Renews DHCPv4 lease for this interface. | |
| Syntax Description | interface-id | The interface |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv action renew interface eth0 ip dhcp-client | |
| REST API | POST https://<ip>/nvue_v1/interface/<interface-id>/ip | |
| Related Commands | | |
| Notes | | |

### 5.10.5.18.6 nv action renew interface ip dhcp-client6

| | | |
|---|---|---|
| | nv action renew interface <interface-id> ip dhcp-client6<br>Renews DHCPv6 lease for this interface. | |
| Syntax Description | interface-id | The interface |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv action renew interface eth0 ip dhcp-client6 | |
| REST API | POST https://<ip>/nvue_v1/interface/<interface-id>/ip/dhcp-client6 | |
| Related Commands | | |
| Notes | | |

## 5.11 Profile

NVOS enables users to manage the system profile. The profile includes settings such as adaptive routing state, group numbers, breakout mode state, and the number of SWIDs.

The user is permitted to manage the number of adaptive-routing groups. For instance:

```
admin@nvos:~$ nv action change system profile adaptive-routing-groups 2048
The operation will reset the system configuration and initiate a reboot.
Type [y] to confirm the system profile change and reboot.
Type [N] to abort.
```

> Performing profile change will lead to factory reset of the system with preserving basic configurations, for more information please see `keep basic` in Restoring Factory Default Configuration section.

## 5.11.1 Profile Commands

- Profile Commands

## 5.11.2 Profile Commands

### 5.11.2.1 nv show system profile

| | |
|---|---|
| | nv show system profile<br>Displays system profile. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | |

```
admin@nvos:~$ nv show system profile
                        operational  applied
----------------------  -----------  --------
adaptive-routing        enabled
adaptive-routing-groups 1792
breakout-mode           enabled
ib-routing              disabled
num-of-swids            1
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/profile |
| Related commands | nv action change system profile |
| Notes | |

### 5.11.2.2 nv action change system profile

| | | |
|---|---|---|
| | nv action change system profile [adaptive-routing-groups <ar_groups>] [force]<br>Sets the profile of the system. | |
| Syntax Description | adaptive-routing-groups | Sets adaptive routing groups.<br>Range: 128-1792 (must be multiples of 128).<br>Allowed only when adaptive routing is enabled. |
| | force | Force the action without asking for user confirmation. |
| Default | adaptive-routing: enabled<br>adaptive-routing-groups: 1792 | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv action change system profile adaptive-routing-groups 1792`<br>`The operation will reset the system configuration and initiate a reboot.`<br>`Type [y] to confirm the system profile change and reboot.`<br>`Type [N] to abort.` |
| REST API | POST https://<ip>/nvue_v1/system/profile |
| Related Commands | nv show system profile<br>nv set/unset interface link breakout |
| Notes | This operation will perform reset factory with preserving basic configurations |

# 5.12 Resource Management

NVOS provides commands for managing and monitoring essential system resources. These tools provide general information about the system, insights into the system's overall health, and resources utilization and usage.

## 5.12.1 Resource Management Commands

- Resource Management Commands

## 5.12.2 Resource Management Commands


- 5.12.2.1 nv show system
- 5.12.2.2 nv show system cpu
- 5.12.2.3 nv show system memory
- 5.12.2.4 nv show system disk
- 5.12.2.5 nv show system disk usage
- 5.12.2.6 nv action erase system disk


### 5.12.2.1 nv show system

| | |
|---|---|
| | nv show system<br>Show general system information. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.4002 Updated memory field in output<br>25.02.5002 Updated output: removed "memory" and "build" fields and added "product-release" field |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show system
                    operational          applied
-----------------   -------------------  --------------
uptime              2:32:29
hostname            switch-85-mgmt2
product-name        nvos
product-release     25.02.4207
status              System is ready
contact             Veni                 Veni
location            Asia                 Asia
date-time
  local-time        2025-05-19 11:38:35
  timezone          Asia/Jerusalem       Asia/Jerusalem
health
  status            OK
version
  product-release   25.02.4207
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system |
| Related commands | |
| Notes | |

## 5.12.2.2 nv show system cpu

| | |
|---|---|
| | nv show system cpu<br>Show system CPU. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.4002—Updated output |
| Example | |

```
admin@nvos:~$ nv show system cpu

                   operational
-----------------  ----------------------------------------
model              Intel(R) Core(TM) i3-8100H CPU @ 3.00GHz
core-count         4
total-utilization  39.9%
load-average
  one-minute       1.67
  five-minute      1.96
  fifteen-minute   1.87


Cores
========
    CPU   Utilization
    ----  -----------
    CPU0  38.5%
    CPU1  43.4%
    CPU2  39.5%
    CPU3  38.2%
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/cpu |
| Related Commands | |
| Notes | |

## 5.12.2.3 nv show system memory

| | |
|---|---|
| | nv show system memory<br>Show system memory. |
| Syntax Description | N/A |
| Default | N/A |

| | |
|---|---|
| History | 25.02.2002 |
| Example | |

```
admin@nvos:~$ nv show system memory


B - Bytes, KB - Kilobytes, MB - Megabytes, GB - Gigabytes, % - Percent

Physical buffer: 53.12 MB
Physical cache: 1.82 GB
Physical free: 5.74 GB
Physical total: 7.46 GB
Physical used: 1.72 GB
Physical utilization: 23.06 %
Swap free: 0 B
Swap total: 0 B
Swap used: 0 B
Swap utilization: 0.00 %
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/memory |
| Related Commands | |
| Notes | |

## 5.12.2.4 nv show system disk

| | |
|---|---|
| | nv show system disk<br>Get system disk information. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.3000 |
| Example | |

```
admin@nvos:~$ nv show system disk
usage
========
    Mount Point  Filesystem  Size        Used       Avail       Use%
    -----------  ----------  ----------  ---------  ----------  -----
    /host        /dev/sda3   146561.67M  12001.51M  134560.16M  8.20%
    /var/log     /dev/loop1  14660.34M   65.66M     14594.69M   0.50%
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/disk |
| Related Commands | nv show system disk usage |
| Notes | |

## 5.12.2.5 nv show system disk usage

| | |
|---|---|
| | nv show system disk usage<br>Get system storage utilization information. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.3000 |
| Example | |

```
admin@nvos:~$ nv show system disk usage
Mount Point  Filesystem  Size       Used      Avail     Use%
-----------  ----------  ---------  --------  --------  ------
/host        /dev/sda3   14549.41M  4611.09M  9938.31M  31.70%
/var/log     /dev/loop1  3951.72M   190.77M   3760.95M  5.10%
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/disk/usage |
| Related Commands | nv show system disk |
| Notes | |

### 5.12.2.6 nv action erase system disk

| | | |
|---|---|---|
| | nv action erase system disk [force]<br>Wipe all the SSD data. | |
| Syntax Description | force | Force the action without asking for user confirmation (the warning message indicating that the disk data will be unrecoverable will be bypassed). |
| Default | N/A | |
| History | 25.02.3000 | |
| Example | `admin@nvos:~$ nv action erase system disk`<br>`admin@nvos:~$ nv action erase system disk force` | |
| REST API | GET https://<ip>/nvue_v1/system/disk | |
| Related Commands | nv action change system security sed-password 12345678 | |
| Notes | The procedure is secure by doing crypto erase and block erase, ensuring the data is unrecoverable.<br>⚠ To reboot after the SSD wipe action finishes, use the following command `/bin/reboot`<br>For more details, see in the Security section. | |

## 5.13 Security


- 5.13.1 SSD Wipe
  - 5.13.1.1 Perform Disk Wipe
- 5.13.2 Recovery Flow After SSD Wipe
  - 5.13.2.1 Prerequisites
  - 5.13.2.2 Recovery Steps
- 5.13.3 Security Commands


### 5.13.1 SSD Wipe

The SSD wipe command below performs a Secure Erase and Crypto Erase.

- Cryptographic Erase (CE) is a secure method for sanitizing entire drives and storage devices by deleting the encryption keys used to protect the data.

- Secure erasure is the process of permanently and irreversibly removing data from a storage device, ensuring that the data cannot be recovered using any means, even with advanced data recovery tools.

#### 5.13.1.1 Perform Disk Wipe

1. To perform the SSD wipe action, run the following command:

```
admin@nvos:~$ nv action erase system disk
```

   More details can be found in the Resource Management Commands section.

   > ⚠ Note that once the action is completed, it will be impossible to recover the SSD data. Additionally, the user will be able to connect to the system until the next reboot, as the file system (only mandatory directories) is loaded into RAM. After a reboot, the user will not be able to see any SSD partitions.

2. Reboot after the SSD wipe action finishes, use the following command:

```
/bin/reboot
```

### 5.13.2 Recovery Flow After SSD Wipe

#### 5.13.2.1 Prerequisites

Before starting the recovery process, ensure the following requirements are met:

- PXE Server Setup
  - A PXE (Preboot Execution Environment) server must be installed and running in the lab network
  - The PXE server should be configured to point to the NVIDIA ONIE image and automatically boot from it without user interaction
- Required Resources
  - NVIDIA ONIE image
  - NVOS image
  - Provisioning package

> ⚠ Performing an SSD wipe will erase the previous NVOS configuration, and it will not be recoverable. Ensure that any required configurations or data are backed up before proceeding.

#### 5.13.2.2 Recovery Steps

1. Wait for NVIDIA ONIE installation to finish (should take up to 3 minutes).
2. Connect to ONIE via ssh. Please refer to UM for ONIE default credentials.
3. Once connected to ONIE, stop onie install by running `onie-stop`.

4. Copy provisioning package (e.g., sed_provisioning_83.03.0001.tgz) to `/tmp`.
5. Extract provisioning script and run it.

```
cd /tmp
tar -xzf sed_provisioning_83.03.0001.tgz
./sedutil_init.sh
```

6. Wait for the script to finish (which can take up to 2 minutes). The device will perform power-cycle.
7. Perform a new NVOS image install following the guidelines in the Installing a New NVOS Image section.

## 5.13.3 Security Commands

- Password Hardening
- SED Commands

## 5.13.4 Password Hardening

NVOS includes a robust password hardening feature to enhance security and protect user accounts.

By default, this feature is disabled.

If enabled, the passwords must meet the following requirements:

- Minimum length of 8 characters
- Inclusion of at least the following:
  - One uppercase letter
  - One lowercase letter
  - One number
  - One special character from the set `` `~!@#$%^&*()-_+=|[{}];:',<.>/? `` and white space
- The password cannot reuse any of the last 10 previously saved passwords
- The password cannot contain the username

The user can choose to enable or disable/change one or more policies or even deactivate the feature entirely.

> ⚠ Password hardening check are forced in NVUE during SET/PATCH operations. Any changes to the policies or feature state must be applied first and will only take effect for subsequent operations.

### 5.13.4.1 Password Hardening Commands

- Password Hardening Commands

### 5.13.4.2 Password Hardening Commands

- 5.13.4.2.1 nv show system security password-hardening

- 5.13.4.2.2 nv set system security password-hardening state
- 5.13.4.2.3 nv set system security password-hardening digits-class
- 5.13.4.2.4 nv set system security password-hardening expiration
- 5.13.4.2.5 nv set system security password-hardening expiration-warning
- 5.13.4.2.6 nv set system security password-hardening history-cnt
- 5.13.4.2.7 nv set system security password-hardening len-min
- 5.13.4.2.8 nv set system security password-hardening lower-class
- 5.13.4.2.9 nv set system security password-hardening reject-user-passw-match
- 5.13.4.2.10 nv set system security password-hardening special-class
- 5.13.4.2.11 nv set system security password-hardening upper-class


### 5.13.4.2.1 nv show system security password-hardening

| | |
|---|---|
| | nv show system security password-hardening<br>Displays the password hardening rules applied on top of the switch. |
| Syntax Description | N/A |
| Default | The example contains the default values of the feature |
| History | 25.02.2002 |
| Example | |

```
admin@nvos:~$ nv show system security password-hardening

                            operational  applied
-----------------------     -----------  -------
state                       enabled      enabled
reject-user-passw-match     enabled      enabled
lower-class                 enabled      enabled
upper-class                 enabled      enabled
digits-class                enabled      enabled
special-class               enabled      enabled
expiration-warning          15           15
expiration                  180          180
history-cnt                 10           10
len-min                     8            8
```

| | |
|---|---|
| Rest API | GET https://<id>/nvue_v1/system/security/password_hardening |
| Related Commands | nv set system security password-hardening |
| Notes | Password hardening rules are applied only to locally stored passwords |

### 5.13.4.2.2 nv set system security password-hardening state

| | | |
|---|---|---|
| | nv set system security password-hardening state <enabled \| disabled><br>Enable or disable the password hardening feature | |
| Syntax Description | state | enabled, disabled |
| Default | disabled | |
| History | 25.02.2002<br>25.02.6077 Updated default to disabled | |
| Example | | |

```
admin@nvos:~$ nv set system security password-hardening state enabled
```

| | |
|---|---|
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/state/ |
| Related Commands | nv show system security password-hardening |

| | |
|---|---|
| Notes | When password hardening is enabled - the switch does not accept hashed passwords |

### 5.13.4.2.3 nv set system security password-hardening digits-class

| | | |
|---|---|---|
| | nv set system security password-hardening digits-class<enabled \| disabled><br>Enable or disable the requirement to enforce digits in the password | |
| Syntax Description | digits-class | enabled, disabled |
| Default | enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system security password-hardening state enabled` | |
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/digits-class/ | |
| Related Commands | nv show system security password-hardening | |
| Notes | | |

### 5.13.4.2.4 nv set system security password-hardening expiration

| | | |
|---|---|---|
| | nv set system security password-hardening expiration [<integer days>]<br>Number of days for password validity, afterwards user will be prompted to change his password | |
| Syntax Description | expiration | expiration days (1-365) |
| Default | 180 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system security password-hardening expiration 200` | |
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/expiration/ | |
| Related Commands | nv show system security password-hardening | |
| Notes | | |

### 5.13.4.2.5 nv set system security password-hardening expiration-warning

| | | |
|---|---|---|
| | nv set system security password-hardening expiration-warning [<integer days>]<br>Number of days for password warning which will alert the user that he needs to change his password before it expires. The alert will appear on the login screen for the user | |
| Syntax Description | expiration-warning | warning days (1-30) |
| Default | 15 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system security password-hardening expiration-warning 10` | |

| | |
|---|---|
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/expiration-warning/ |
| Related Commands | nv show system security password-hardening |
| Notes | |

### 5.13.4.2.6 nv set system security password-hardening history-cnt

| | | |
|---|---|---|
| | nv set system security password-hardening history-cnt [<integer count>]<br>Number of passwords the system will compare the current password against. If the password is equal to one of the previously configured password, the system will reject it. | |
| Syntax Description | history-cnt | history count (1-100) |
| Default | 10 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system security password-hardening history-cnt 5` | |
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/history-cnt/ | |
| Related Commands | nv show system security password-hardening | |
| Notes | | |

### 5.13.4.2.7 nv set system security password-hardening len-min

| | | |
|---|---|---|
| | nv set system security password-hardening len-min [<integer length>]<br>Set the minimum length for a password. | |
| Syntax Description | len-min | length (6-32) |
| Default | 8 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system security password-hardening len-min 10` | |
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/len-min/ | |
| Related Commands | nv show system security password-hardening | |
| Notes | | |

### 5.13.4.2.8 nv set system security password-hardening lower-class

| | | |
|---|---|---|
| | nv set system security password-hardening lower-class <enabled/disabled><br>Enable or disable the requirement to enforce lower case letters in the password. | |
| Syntax Description | lower-class | enabled/disabled |
| Default | enabled | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv set system security password-hardening lower-class <enabled/disabled>` |
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/lower-class/ |
| Related Commands | nv show system security password-hardening |
| Notes | |

### 5.13.4.2.9 nv set system security password-hardening reject-user-passw-match

| | | |
|---|---|---|
| | nv set system security password-hardening reject-user-passw-match<enabled/disabled><br>Enable or disable allowing the username and password to be identical. | |
| Syntax Description | reject-user-passw-match | enabled/disabled |
| Default | enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system security password-hardening state <enabled/disabled>` | |
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/reject-user-passw-match/ | |
| Related Commands | nv show system security password-hardening | |
| Notes | | |

### 5.13.4.2.10 nv set system security password-hardening special-class

| | | |
|---|---|---|
| | nv set system security password-hardening special-class <enabled/disabled><br>Enable or disable the requirement to enforce special characters in the password. | |
| Syntax Description | special-class | feature state |
| Default | enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system security password-hardening special-class disabled` | |
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/special-class/ | |
| Related Commands | nv show system security password-hardening | |
| Notes | • The special characters allowed are: `~!@#$%^&*()-_+=\|[{}];:',<.>/? and white space<br>• These characters must be accompanied by quotation marks "" in order to be received correctly in the password string.<br>• Example: nv set system aaa user example password "123%$Aabcv" | |

#### 5.13.4.2.11 nv set system security password-hardening upper-class

| | | |
|---|---|---|
| | nv set system security password-hardening upper-class <enabled/disabled><br>Enable or disable the requirement to enforce upper case letters in the password. | |
| Syntax Description | upper-class | enabled/disabled |
| Default | enabled | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system security password-hardening upper-class enabled` | |
| REST API | PATCH https://<id>/nvue_v1/system/security/password_hardening/upper-class/ | |
| Related Commands | nv show system security password-hardening | |
| Notes | | |

### 5.13.5 SED Commands

To support all SED features, a PBA version greater than 83.02.0003 is required.

#### 5.13.5.1 nv action change system security sed-password

| | | |
|---|---|---|
| | nv action change system security [sed-password]<br>Change the SED password by setting a new password chosen by the user. | |
| Syntax Description | sed-password | Minimum password length: 8 charachters<br>Maximum password length: 250 charachters |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action change system security sed-password 12345678` | |
| REST API | POST https://<ip>/nvue_v1/system/security | |
| Related Commands | | |
| Notes | The password can be up to 250 characters but it is hashed down to 32 bytes to conform to the size required by the drive. | |

## 5.14 System API

NVOS offers commands for managing and monitoring its external REST API interface. These capabilities allow users to configure, enable, and monitor API settings, ensuring secure and efficient interaction with external systems.

## 5.14.1 Key Functionalities

- API State Management: Enable or disable external REST API access.
- Port Configuration: Specify the port number on which the REST API listens, with a default setting of 443.
- Certificate Management: View and configure the CA certificate for mutual TLS (mTLS) connections. For more examples on how to import and set certificates, Please see "Certificates Management" section.
- Operational Metrics: Retrieve detailed API usage statistics, including active connections, total requests, and the status of ongoing requests.

## 5.14.2 System API Commands

- System API Commands

## 5.14.3 System API Commands


- 5.14.3.1 nv show system api
- 5.14.3.2 nv set/unset system api state
- 5.14.3.3 nv set/unset system api port
- 5.14.3.4 nv show system api mtls
- 5.14.3.5 nv set system api mtls ca-certificate
- 5.14.3.6 nv set system api certificate


### 5.14.3.1 nv show system api

| | |
|---|---|
| | nv show system api<br>Show NVUE external REST API configuration. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |
| Example | |

```
admin@nvos:~$ nv show system api

                    operational  applied
------------------  -----------  -----------
state               enabled      enabled
port                443          443
certificate         cert_id_304  cert_id_304
[listening-address] any
mtls
  ca-certificate    ca_id_49     ca_id_49
connections
  active            1
  accepted          1
  handled           1
  requests          1
  reading           0
  writing           1
  waiting           0
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/api |

| | |
|---|---|
| Related Commands | nv set/unset system api state<br>nv set/unset system api port |
| Notes | |

### 5.14.3.2 nv set/unset system api state

| | | |
|---|---|---|
| | nv set/unset system api state <enabled \| disabled><br>Set the REST API external access state. | |
| Syntax Description | state | enabled, disabled |
| Default | enabled | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show system api<br>admin@nvos:~$ nv set system api state enabled | |
| REST API | PATCH https://<ip>/nvue_v1/system/api | |
| Related Commands | nv show system api | |
| Notes | | |

### 5.14.3.3 nv set/unset system api port

| | | |
|---|---|---|
| | nv set/unset system api port <port-number><br>Set the REST API listen port. | |
| Syntax Description | port-number | Port number of the remote syslog server: 1-65535 |
| Default | 443 | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system api port 443 | |
| REST API | PATCH https://<ip>/nvue_v1/system/api | |
| Related Commands | nv show system api | |
| Notes | | |

### 5.14.3.4 nv show system api mtls

| | |
|---|---|
| | nv show system api mtls<br>Show configured CA certificate for API mTLS connections. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv show system api mtls`<br>`  operational  applied`<br>`--------------  -----------  ---------`<br>`ca-certificate  nvue_root  nvue_root` |
| REST API | GET https://<ip>/nvue_v1/system/api/mtls |
| Related Commands | |
| Notes | nv show system api |

## 5.14.3.5 nv set system api mtls ca-certificate

| | | |
|---|---|---|
| | nv set system api mtls ca-certificate <cacert-id><br>Set CA certificate for API mTLS connection. | |
| Syntax Description | cacert-id | CA certificate ID string |
| Default | none | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv set system api  mtls ca-certificate nvue_root` | |
| REST API | PATCH https://<ip>/nvue_v1/system/api/mtls?rev= Content-Type: application/json<br>{"ca-certificate": "cacert_id"} | |
| Related Commands | | |
| Notes | | |

## 5.14.3.6 nv set system api certificate

| | | |
|---|---|---|
| | nv set system api certificate <cert-id><br>Set certificate for API connection. | |
| Syntax Description | cert-id | Certificate ID string |
| Default | none | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv set system api certificate cert cert_id` | |
| REST API | PATCH https://<ip>/nvue_v1/system/api/mtls?rev= Content-Type: application/json<br>{"certificate": "cert_id"} | |
| Related Commands | | |
| Notes | | |

# 5.15 Time Synchronization

NVOS relies on the system clock for displaying the time and timestamping messages. The date and time can be configured manually, or synchronization with Network Time Protocol (NTP) servers can be enabled.

For more information, see the following sections:

- Date and Time
- NTP

## 5.15.1 Date and Time

NVOS allows to control the system time zone and clock settings.

### 5.15.1.1 Time Zone

Default time zone is set to Coordinated Universal Time (UTC). User may change the time zone configuration by executing the following:

```
admin@nvos:~$ nv set system timezone Etc/UTC
admin@nvos:~$ nv config apply
```

### 5.15.1.2 Clock

The system date and time can be manually changed. NTP servers configured on the switch will supersede any manually entered date-time settings.

```
admin@nvos:~$ nv action change system date-time 2024-12-24 10:25:13
```

### 5.15.1.3 Date and Time Commands

- Date and Time Commands

### 5.15.1.4 Date and Time Commands


- 5.15.1.4.1 nv show system date-time
- 5.15.1.4.2 nv action change system date-time
- 5.15.1.4.3 nv set/unset system date-time timezone


#### 5.15.1.4.1 nv show system date-time

| | nv show system date-time<br>Show detailed system date and time information |
|---|---|
| Syntax Description | N/A |
| Default | N/A |

| | |
|---|---|
| History | 25.02.5002 |
| Example | |

```
admin@nvos: ~$ nv show system date-time

                          operational                   applied
------------------------  --------------------------    --------------
local-time                Tue 2025-04-08 17:28:16 IDT
universal-time            Tue 2025-04-08 14:28:16 UTC
rtc-time                  Tue 2025-04-08 14:28:17
system-clock-synchronized no
ntp-service               n/a
rtc-in-local-tz           no
timezone                  Asia/Jerusalem                Asia/Jerusalem
unix-time                 1744122496.6114235
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/date-time |
| Related commands | |
| Notes | |

## 5.15.1.4.2 nv action change system date-time

| | | |
|---|---|---|
| | nv action change system date-time <yyyy-mm-dd> <hh:mm:ss><br>Sets the time and date. | |
| Syntax Description | hh:mm:ss | Time |
| | yyyy-mm-dd | Date |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv action change system date-time 2021-01-01 10:10:11
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/date-time |
| Related Commands | nv show system |
| Notes | Unable to change date and time in case NTP is enabled. |

## 5.15.1.4.3 nv set/unset system date-time timezone

| | | |
|---|---|---|
| | nv set system date-time timezone <timezone><br>nv unset system date-time timezone<br>Sets the system time zone.<br>The no form of the command resets time zone to its default (Etc/UTC). | |
| Syntax Description | timezone | A valid timezone value (e.g., Africa/Abidjan, Brazil/Acre, Africa/Accra, Chile/Continental) |
| Default | Etc/UTC | |
| History | 25.02.2002<br>25.02.5002 Updated command syntax | |
| Example | | |

```
admin@nvos:~$ nv set system date-time timezone Etc/UTC
```

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/system/date-time |
| Related Commands | nv show system |

| | |
|---|---|
| Notes | The time zone may be specified in one of three ways:<br>• A nearby city whose time zone rules to follow. The system has a large list of cities which can be displayed by the help and completion system. They are organized hierarchically because there are too many of them to display in a flat list. A given city may be required to be specified in two, three, or four words, depending on the city<br>• An offset from Etc/GMT. This will be in the form Etc/GMT-offset, Etc/GMT+<0-14>, Etc/GMT-<1-12><br>• Etc/UTC (Universal Time, which is almost identical to GMT), and this is the default time zone |

## 5.15.2 NTP

Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over variable-latency data networks. NTP is intended to synchronize all participating computers to within a few milliseconds of Coordinated Universal Time (UTC) and is designed to mitigate the effects of variable network latency. NTP can usually maintain time to within tens of milliseconds over the public Internet, and can achieve better than one millisecond accuracy in local area networks under ideal conditions.

### 5.15.2.1 NTP Authenticate

When authentication of incoming NTP packets is enabled, the switch ensures that they come from an authenticated time source before using them for time synchronization on the switch. Authentication keys are created and marked as trusted.

To add a key to be used for authentication, take the following steps

1. Create the key.

```
admin@nvos:~$ nv set system ntp key 1
```

2. Specify the value.

```
admin@nvos:~$ nv set system ntp key 1 value mystrongpassword
```

3. Trust new added key.

```
admin@nvos:~$ nv set system ntp key 1 trusted yes
```

4. Assign the key to the server.

```
admin@nvos:~$ nv set system ntp server 10.34.1.1 key 1
```

### 5.15.2.2 NTP Authentication Key

An authentication key may be created and used to authenticate incoming NTP packets. For the key to be used, make sure the following is in place.

1. It should be shared with the NTP server sending the NTP packet.
2. The key should be marked as trusted.
3. NTP authentication should be enabled on the system.

## 5.15.2.3 NTP Commands

- NTP Commands

## 5.15.2.4 NTP Commands


- 5.15.2.4.1 nv show system ntp
- 5.15.2.4.2 nv show system ntp server
- 5.15.2.4.3 nv show system ntp key
- 5.15.2.4.4 nv set/unset system ntp
- 5.15.2.4.5 nv set/unset system ntp listen
- 5.15.2.4.6 nv set/unset system ntp server
- 5.15.2.4.7 nv set/unset system ntp key


### 5.15.2.4.1 nv show system ntp

| | | |
|---|---|---|
| | nv show system ntp<br>Display NTP configuration.<br>It shows the next information: status (offset, reference), authentication, listening interface, NTP state, NTP DHCP state, VRF device. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |

```
admin@nvos:~$ nv show system ntp
                operational           applied
--------------  --------------------  --------------------
reference       84.254.80.94
offset          516 ms
status          synchronised
[listen]        eth1                  eth1
state           enabled               enabled
dhcp            enabled               enabled
vrf             default               default
authentication  disabled              disabled
[server]        ntp0.ntp-servers.net  ntp0.ntp-servers.net
[server]        ntp1.ntp-servers.net  ntp1.ntp-servers.net
[server]        ntp2.ntp-servers.net  ntp2.ntp-servers.net
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/ntp |
| Related Commands | |
| Notes | By default, NTP DHCP is enabled, so if the DHCP server sends out NTP servers to the clients, the switch will get it and will be synchronized with it. |

### 5.15.2.4.2 nv show system ntp server

| | | |
|---|---|---|
| | nv show system ntp server [<server-id> \| detail]<br>Display NTP servers configuration and detail data.<br>The command shows the following information: aggressive polling state, server type, authentication key, server IP address, server state, trustiness, protocol version. | |
| Syntax Description | server-id | Hostname or IP address of the NTP server.<br>Show configuration for a specific configured NTP server. |

| | | |
|---|---|---|
| | detail | Detail view: Show detail data from NTP servers. |
| Default | N/A | |
| History | 25.02.2002<br>25.02.5002 Added the `detail` option and updated output | |
| Example | | |

```
admin@nvos:~$ nv show system ntp server
NTP server       Aggressive  Type    KeyID  Resolve as       Source       State    Trusted
Ver
---------------  ----------  ------  -----  ---------------  -----------  -------  -------
---
37.53.71.213                 server         37.53.71.213     pool
46.173.175.211               server         46.173.175.211   pool
162.159.200.123              server         162.159.200.123  pool
193.84.22.254                server         193.84.22.254    pool
time.google.com  disabled    server         216.239.35.0     user-config  enabled  no
4
ua.pool.ntp.org  disabled    pool           N/A              user-config  enabled  no
4
```

```
admin@nvos:~$ nv show system ntp server detail
NTP server       Auth  Delay   Jitter  Offset   Peer State      Poll  Reach  Ref clock
Stratum  Peer  When
---------------  ----  ------  ------  -------  --------------  ----  -----  -------------
-------  ----  ----
37.53.71.213     none  98.736  21.749  +0.337   reject-outlier  128   377    17.253.14.253
2        u     4
46.173.175.211   none  87.295  13.791  +4.291   candidate       64    377    17.253.38.125
2        u     60
162.159.200.123  none  59.550  1.401   +2.900   candidate       64    377    10.121.10.17
3        u     62
193.84.22.254    none  98.181  20.997  +11.218  reject-outlier  128   377    .PPS.
1        u     1
time.google.com  none  63.111  30.026  +2.891   sys-peer        64    377    .GOOG.
1        u     65
ua.pool.ntp.org  none  0.000   0.000   +0.000   reject-other    64    0      .POOL.
16       p     -
```

```
admin@nvos:~$ nv show system ntp server 10.7.77.134
                    operational     applied
------------------  --------------  --------
iburst              disabled        disabled
state               enabled         enabled
trusted             no              no
version             4               4
association-type    server          server
resolve-as          10.7.77.134
auth-state          none
delay               98.736
jitter              21.749
offset              +0.337
peer-state          reject-outlier
poll                128
reach               377
ref-clock           17.253.14.253
stratum             2
peer                u
when                4
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/ntp/server<br>GET https://<ip>/nvue_v1/system/ntp/server/<server-id> |
| Related Commands | |
| Notes | |

## 5.15.2.4.3 nv show system ntp key

| | | |
|---|---|---|
| | nv show system ntp key [<key-id>]<br>Display NTP authentication keys inventory.<br>It shows the next information: key ID, key type, obfuscated value. | |
| Syntax Description | key-id | NTP authentication key ID.<br>Show the configuration of a specific authentication key. |

| | |
|---|---|
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show system ntp key`<br>`KeyID  Trusted  Type  Value`<br>`-----  -------  ----  -----`<br>`1  yes  md5  *`<br>`42  yes  sha1  *`<br><br>`admin@nvos:~$ nv show system ntp key 42`<br>`  operational  applied`<br>`-------  -----------  -------`<br>`trusted  yes  yes`<br>`type  sha1  sha1`<br>`value  *  *` |
| REST API | GET https://<ip>/nvue_v1/system/ntp/key<br>GET https://<ip>/nvue_v1/system/ntp/key/<key-id> |
| Related Commands | |
| Notes | |

### 5.15.2.4.4 nv set/unset system ntp

| | | |
|---|---|---|
| | nv set system ntp [state {enabled,disabled} \| dhcp {enabled,disabled} \| vrf {default} \| authentication {enabled,disabled}]<br>nv unset system ntp<br>Update NTP global configuration.<br>The unset form of the command returns NTP global configuration to its default. | |
| Syntax Description | state | NTP state configuration. |
| | dhcp | Use NTP servers leased from DHCP server. |
| | vrf | VRF to run NTP daemon in. Limited to "default" only. |
| | authentication | Enables NTP authentication. |
| Default | state | enabled |
| | dhcp | enabled |
| | vrf | default |
| | authentication | disabled |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv unset system ntp`<br><br>`admin@nvos:~$ nv set system ntp authentication enabled`<br><br>`admin@nvos:~$ nv unset system ntp state` | |
| REST API | PATCH https://<ip>/nvue_v1/system/ntp | |
| Related Commands | nv set system ntp server | |
| Notes | | |

### 5.15.2.4.5 nv set/unset system ntp listen

| | | |
|---|---|---|
| | nv set system ntp listen <interface-id><br>nv unset system ntp listen<br>Update NTP listen configuration.<br>The unset form of the command returns NTP listen configuration to its default. | |
| Syntax Description | interface-id | Interface ID |
| Default | eth0 | |
| History | 25.02.5002 | |
| Example | `admin@nvos:~$ nv unset system ntp listen` | |
| REST API | PATCH https://<ip>/nvue_v1/system/ntp/listen | |
| Related Commands | nv set system ntp server | |
| Notes | | |

### 5.15.2.4.6 nv set/unset system ntp server

| | | |
|---|---|---|
| | nv set system ntp server [<server-id> [iburst {enabled,disabled} \| state {enabled,disabled} \| key <1-65535> \| trusted {yes,no} \| version {3,4} \| association-type {server,pool}]]<br>nv unset system ntp server<br>Update the NTP servers configuration.<br>The unset form of the command returns the NTP server configuration to its default. | |
| Syntax Description | server-id | Hostname or IP address of the NTP server. |
| | iburst | Aggressive polling of the server. |
| | state | Temporarily disable/enable this NTP server. |
| | key | Specify the key ID to securely communicate with the remote NTP server. |
| | trusted | Trust that NTP server.<br>If authentication is configured this will additionally force all time updates to only use trusted servers. |
| | version | The NTP protocol version to communicate with the remote server. |
| | association-type | NTP server association type. |
| Default | iburst | on |
| | state | disabled |
| | trusted | no |
| | version | 4 |
| | association-type | server |
| History | 25.02.2002<br>25.02.5002 Updated command output. Updated command option (iburst) | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv unset system ntp server`<br>`admin@nvos:~$ nv unset system ntp server 10.10.10.10`<br>`admin@nvos:~$ nv set system ntp server 10.10.10.10 trusted yes`<br>`admin@nvos:~$ nv unset system ntp server 10.10.10.10 key` |
| REST API | PATCH https://<ip>/nvue_v1/system/ntp/server<br>PATCH https://<ip>/nvue_v1/system/ntp/server/<server-id> |
| Related Commands | nv set system ntp key |
| Notes | When authentication of incoming NTP packets is enabled, the switch ensures that they come from an authenticated time source before using them for time synchronization on the switch.<br>An authentication key may be created and used to authenticate incoming NTP packets. For the key to be used, make sure the following is in place.<br>1. It should be shared with the NTP server sending the NTP packet.<br>2. The key should be trusted.<br>3. NTP authentication should be enabled on the system |

### 5.15.2.4.7 nv set/unset system ntp key

| | | |
|---|---|---|
| | nv {set,unset} system ntp key [<key-id> [trusted {yes,no} \| type {md5,sha1} \| value <value>]]<br>Update the NTP keys configuration. | |
| Syntax Description | key-id | NTP authentication key ID. |
| | trusted | Trust that NTP authentication key. |
| | type | Authentication key type. |
| | value | Secret authentication key value. |
| Default | trusted | no |
| | type | md5 |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv unset system ntp key`<br>`admin@nvos:~$ nv unset system ntp key 3`<br>`admin@nvos:~$ nv set system ntp key type sha1`<br>`admin@nvos:~$ nv unset system ntp key type` | |
| REST API | PATCH https://<ip>/nvue_v1/system/ntp/key<br>PATCH https://<ip>/nvue_v1/system/ntp/key/<key-id> | |

| | |
|---|---|
| Related Commands | nv set system ntp server |
| Notes | |

# 5.16 User Interfaces

This section provides information on the interfaces available for users to manage and validate the status of their switch system.


- Secure Shell (SSH) for Remote Access
- User Interface Commands


## 5.16.1 Secure Shell (SSH) for Remote Access


- 5.16.1.1 Overview
- 5.16.1.2 Configure Timeouts and Sessions
  - 5.16.1.2.1 Message of the Day
  - 5.16.1.2.2 Generate and Install an SSH Key Pair
    - 5.16.1.2.2.1 Generate an SSH Key Pair
    - 5.16.1.2.2.2 Install an Authorized SSH Key
    - 5.16.1.2.2.3 PKA-Only
  - 5.16.1.2.3 Troubleshooting
- 5.16.1.3 SSH Commands


NVOS uses the OpenSSH package to provide access to the system using the Secure Shell (SSH) protocol.

### 5.16.1.1 Overview

You can configure SSH to provide login access to the root user and to specific user accounts, limit SSH to listen on a specific VRF, and configure timeouts and session options.

- SSH server configuration changes take effect only in new SSH sessions and do not impact existing ones.
- SSH Strict Mode: By default, NVOS disables the following SSH server configurations: X11, TCP forwarding, and compression and enforces secure ciphers.

### 5.16.1.2 Configure Timeouts and Sessions

You can configure the following SSH timeout and session options:

- The number of login attempts allowed before rejecting the SSH session. You can specify a value between 3 and 100. The default value is 3 login attempts.
- The number of seconds allowed before login times out. You can specify a value between 1 and 600. The default value is 120 seconds.
- The TCP port numbers that listen for incoming SSH sessions. You can specify a value between 1 and 65535.

- The number of minutes a session can be inactive before the SSH server terminates the connection. The default value is 20 minutes.
- The maximum number of SSH sessions allowed per TCP connection. You can specify a value between 1 and 100. The default value is 10.

The following example configures the number of login attempts allowed before rejecting the SSH session to 10 and the number of seconds allowed before login times out to 200:

```
admin@nvos:~$ nv set system ssh-server authentication-retries 10
admin@nvos:~$ nv set system ssh-server login-timeout 200
admin@nvos:~$ nv config apply
```

The following example configures the TCP port that listens for incoming SSH sessions to 443:

```
admin@nvos:~$ nv set system ssh-server port 443
admin@nvos:~$ nv config apply
```

The following example configures the amount of time a session can be inactive before the SSH server terminates the connection to 5 minutes (300 seconds) and the maximum number of cuncurrent SSH user sessions to 5. The default `inactive-timeout` is 20 minutes and the default `max-sessions` is 100:

```
admin@nvos:~$ nv set system ssh-server inactive-timeout 5
admin@nvos:~$ nv set system ssh-server max-sessions 5
admin@nvos:~$ nv config apply
```

#### 5.16.1.2.1 Message of the Day

When you log into the switch, NVOS shows system health information and login notifications.

Example:

```
Last login: Thu Jun 19 04:52:31 UTC 2025 from 10.20.30.40 on pts/0
Number of total successful connections since last 1 days: 6
```

### SSH Login Notifications

NVOS shows the following SSH login information on the console after authentication:

- The date and time of the last successful login.
- The number of unsuccessful logins after the last successful login.
- The date and time of the last unsuccessful login.
- Changes to a user account after the last login (password, role, group, and so on).
- The location (terminal or IP) of the last successful or unsuccessful login.
- The total number of successful logins after a specific date and time.

NVOS displays login notifications for both SSH and serial connections. The information can help to detect unwanted or malicious activities, such as suspicious logins or password and role changes.

To configure the time period in days during which to show login notifications, run the `nv set system ssh-server login-record-period <days>` command. You can specify a value between 1 and 30. The default value is 1.

The following example sets the SSH login notification period to 20 days:

```
admin@nvos:~$ nv set system ssh-server login-record-period 20
admin@nvos:~$ nv config apply
```

To set the SSH login notification period back to the default value (1 day), run the `nv unset system ssh-server login-record-period` command.

To show the configured SSH login notification period, run the `nv show system ssh-server` comma nd. See Troubleshooting below.

## 5.16.1.2.2 Generate and Install an SSH Key Pair

This section describes how to generate an SSH key pair on one system and install the key as an authorized key on another system.

### 5.16.1.2.2.1 Generate an SSH Key Pair

To generate an SSH key pair, run the `ssh-keygen` command and follow the prompts.

NVOS does not support sha1 ssh key exchange methods.

To configure the system without a password, do not enter a passphrase when prompted in the following step.

```
 admin@host01:~$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/admin/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/admin/.ssh/id_rsa.
Your public key has been saved in /home/admin/.ssh/id_rsa.pub.
The key fingerprint is:
5a:b4:16:a0:f9:14:6b:51:f6:f6:c0:76:1a:35:2b:bb cumulus@leaf04
The key's randomart image is:
+---[RSA 2048]----+
|      +.o   o    |
|     o * o . o   |
|    o + o O o    |
|     + . = O     |
|      . S o .    |
|       +   .     |
|      .   E      |
|                 |
|                 |
+-----------------+
```

### 5.16.1.2.2.2 Install an Authorized SSH Key

To install an authorized SSH key, you take the contents of an SSH public key and add it to the SSH authorized key file ( `~/.ssh/authorized_keys` ) of the user.

A public key is a text file with three space separated fields:

`<type> <key string> <comment>`

| Field | Description |
| --- | --- |
| `<type>` | The algorithm you want to use to hash the key. The algorithm can be `ecdsa-sha2-nistp256`, `ecdsa-sha2-nistp384`, `ecdsa-sha2-nistp521`, `ssh-dss`, `ssh-ed25519`, or `ssh-rsa` (the default value). |
| `<key string>` | A base64 format string for the key. |
| `<comment>` | A single word string. By default, this is the name of the system that generated the key. NVUE uses the `<comment>` field as the key name. |

The procedure to install an authorized SSH key is different based on whether the user is an NVUE managed user or a non-NVUE managed user.

NVUE Managed User

The following example adds an authorized key named `prod_key` to the user `admin2`. The content of the public key file is `ssh-rsa 1234 prod_key`.

```
admin@nvos:~$ nv set system aaa user admin2 ssh authorized-key prod_key key XABDB3NzaC1yc2EAAAADAQABAAABgQCvjs/
RFPhxLQMkckONg+1RE1PTIO2JQhzFN9TRg7ox7o0tfZ+IzSB99lr2dmmVe8FRWgxVjc...
admin@nvos:~$ nv set system aaa user admin2 ssh authorized-key prod_key type ssh-rsa
admin@nvos:~$ nv config apply
```

#### 5.16.1.2.2.3 PKA-Only

This configuration allows blocking password authentication from users that have a configured authorized key.

To enable this flag, run the following:

```
admin@nvos:~$ nv set system ssh-server pka-only enabled
admin@nvos:~$ nv config apply
```

### 5.16.1.2.3 Troubleshooting

To show all the current SSH server configuration settings, run the NVUE `nv show system ssh-server` command:

```
admin@nvos:~$ nv show system ssh
                        operational  applied
----------------------  -----------  --------
authentication-retries  6            6
login-timeout           120          120
inactive-timeout        20           20
login-record-period     1            1
max-sessions            100          100
pka-only                disabled     disabled
[port]                  22           22
```

To show the TCP port numbers that listen for incoming SSH sessions, run the `nv show system ssh-server port` command. You can also show information for a specific port with the `nv show system ssh-server port <port>` command.

## 5.16.1.3 SSH Commands

- SSH Commands

## 5.16.1.4 SSH Commands


- 5.16.1.4.1 show ssh-server
- 5.16.1.4.2 nv set/unset system ssh-server inactive-timeout
- 5.16.1.4.3 nv set/unset system ssh-server max-sessions
- 5.16.1.4.4 nv set/unset system ssh-server port


### 5.16.1.4.1 show ssh-server

| | | |
|---|---|---|
| | nv show ssh-server<br>Limit the maximum number of concurrent user sessions. | |
| Syntax Description | N/A | |
| Default | 100 | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |
| REST API | GET https://<ip>/nvue_v1/system/ssh-server | |
| Related Commands | nv show system ssh-server | |
| Notes | Applied for new connections only. | |

```
admin@nvos:~$ nv show system ssh-server
                        operational  applied
----------------------  -----------  --------
authentication-retries  6            6
login-timeout           120          120
inactive-timeout        15           15
login-record-period     1            1
max-sessions            100          100
pka-only                disabled     disabled
[port]                  22           22
```

### 5.16.1.4.2 nv set/unset system ssh-server inactive-timeout

| | | |
|---|---|---|
| | nv set/unset system ssh-server inactive-timeout [<integer time>]<br>Configure inactive timeout for ssh connections in minutes <0-35000>. | |
| Syntax Description | integer time | Number of minutes: 0-35000 minutes |
| Default | 15 minutes | |
| History | 25.02.2002<br>25.02.5002 Updated command syntax | |
| Example | | |
| REST API | PATCH https://<ip>/nvue_v1/system/ssh-server | |
| Related Commands | nv show system ssh-server | |

```
admin@nvos:~$ nv set system ssh-server inactive-timeout 300
```

| | |
|---|---|
| Notes | Applied for new connections only. |

### 5.16.1.4.3 nv set/unset system ssh-server max-sessions

| | | |
|---|---|---|
| | nv set/unset system ssh-server max-sessions [<integer sessions>]<br>Configuring the maximum number of ssh connections <3-100>. | |
| Syntax Description | integer sessions | Number of sessions: 3-100 sessions |
| Default | 100 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system ssh-server max-sessions 10` | |
| REST API | PATCH https://<ip>/nvue_v1/system/ssh-server | |
| Related Commands | nv show system ssh-server | |
| Notes | Applied for new connections only. | |

### 5.16.1.4.4 nv set/unset system ssh-server port

| | | |
|---|---|---|
| | nv set/unset system ssh-server port <port-id><br>Configure the ports for the systems ssh-server. | |
| Syntax Description | port-id | TCP Port ID (integer: 1-65535) |
| Default | 22 | |
| History | 25.02.2002<br>25.02.5002 Updated command syntax | |
| Example | `admin@nvos:~$ nv set system ssh-server port 777` | |
| REST API | PATCH https://<ip>/nvue_v1/system/ssh-server | |
| Related Commands | nv show system ssh-server | |
| Notes | Multiple ports can be configured. By default, port 22 is used. Any user configuration will remove the default, the user need to configure port 22 explicitly. | |

## 5.16.2 User Interface Commands


- 5.16.2.1 System Message
  - 5.16.2.1.1 nv show system message
  - 5.16.2.1.2 nv set/unset system message pre-login message
  - 5.16.2.1.3 nv set/unset system message post-login message
  - 5.16.2.1.4 nv set/unset system message post-logout
- 5.16.2.2 Serial-Console
  - 5.16.2.2.1 nv show system serial-console
  - 5.16.2.2.2 nv set/unset system serial-console sysrq-capabilities

- 5.16.2.3 System CLI
  - 5.16.2.3.1 nv show system cli
  - 5.16.2.3.2 nv set/unset system cli inactive-timeout


## 5.16.2.1 System Message

### 5.16.2.1.1 nv show system message

| | | |
|---|---|---|
| | nv show system message<br>Display banner messages for different terminal session events: pre-login, post-login and post-logout messages. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |

```
admin@nvos:~ nv show system message
             operational          applied
-----------  -------------------  -------------------
pre-login    pre_login_message    pre_login_message
post-login   post_login_message   post_login_message
post-logout  post_logout_message  post_logout_message
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/message |
| Related Commands | nv set system message pre-login<br>nv set system message post-login |
| Notes | Printed as raw, unformatted output |

### 5.16.2.1.2 nv set/unset system message pre-login message

| | | |
|---|---|---|
| | nv set system message pre-login {message}<br>nv unset system message pre-login<br>Set/unset the pre-login message. | |
| Syntax Description | message | The new pre-login message to set |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set system message pre-login new-pre
admin@nvos:~$ nv unset system message pre-login
```

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/system/message |
| Related Commands | nv show system message |
| Notes | |

### 5.16.2.1.3 nv set/unset system message post-login message

| | | |
|---|---|---|
| | nv set system message post-login {message}<br>nv unset system message post-login<br>Set the post-login message.<br>The unset form of the command unsets the post-login message. | |
| Syntax Description | message | The new post-login message to set |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system message post-login new-post<br>admin@nvos:~$ nv unset system message post-login | |
| REST API | PATCH https://<ip>/nvue_v1/system/message | |
| Related Commands | nv show system message | |
| Notes | | |

### 5.16.2.1.4 nv set/unset system message post-logout

| | | |
|---|---|---|
| | nv set system message post-logout <message><br>nv unset system message post-logout<br>Set/unset the post-logout message. | |
| Syntax Description | message | The new post-logout message to set |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system message post-logout Goodbye | |
| REST API | PATCH https://<ip>/nvue_v1/system/message | |
| Related Commands | nv show system message | |
| Notes | | |

## 5.16.2.2 Serial-Console

### 5.16.2.2.1 nv show system serial-console

| | |
|---|---|
| | nv show system serial-console<br>Show system serial console. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output<br>25.02.5002 Updated command output |

| | |
|---|---|
| Example | `admin@nvos:~$ nv show system serial-console`<br>`  operational  applied`<br>`----------  ----------  --------`<br>`sysrq-capabilities  disabled  disabled` |
| REST API | GET https://<ip>/nvue_v1/system/serial-console |
| Related Commands | nv set system serial-console sysrq-capabilities |
| Notes | Applied after reconnection only. |

### 5.16.2.2.2 nv set/unset system serial-console sysrq-capabilities

| | |
|---|---|
| | nv set/unset system serial-console sysrq-capabilities<br>Enables or disables SysRq key capabilities. |
| Default | Disabled |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv set system serial-console sysrq-capabilities enabled` |
| REST API | PATCH https://<ip>/nvue_v1/system/ssh-server |
| Related Commands | nv show system serial-console |
| Notes | |

## 5.16.2.3 System CLI

### 5.16.2.3.1 nv show system cli

| | |
|---|---|
| | nv show system cli<br>Show System CLI. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.5002 |
| Example | `admin@nvos:~$ nv show system cli`<br>`  operational  applied`<br>`----------  -----------  -------`<br>`inactive-timeout  20  20` |
| REST API | GET https://<ip>/nvue_v1/system/cli |
| Related Commands | nv set system cli inactive-timeout |
| Notes | |

### 5.16.2.3.2 nv set/unset system cli inactive-timeout

| | |
|---|---|
| | nv set system cli inactive-timeout [minutes]<br>nv unset system cli inactive-timeout<br>Configure inactive timeout for CLI. |

| | | |
|---|---|---|
| Syntax Description | minutes | The number of minutes before CLI becomes inactive.<br>Maximum timeout: 86400 (minutes) |
| Default | 20 | |
| History | 25.02.5002 | |
| Example | `admin@nvos:~$ nv set system cli inactive-timeout 300` | |
| REST API | PATCH https://<ip>/nvue_v1/system/cli | |
| Related Commands | | |
| Notes | | |

# 5.17 Zero-Touch Provisioning


- 5.17.1 Running DHCP-ZTP
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- 5.17.6 Zero-Touch Provisioning Commands


Zero-touch Provisioning (ZTP) automates the initial configuration of switch systems at boot time. It helps minimize manual operation and reduce customer initial deployment costs. ZTP allows for automatic upgrade of the switch with a specified OS image, setting up a switch configuration, and checking connectivity to external resources.

A switch configuration is applied by using either of the following two formats: YAML format file configuration or CLI commands in the regular text file.

The user can create a YAML configuration file by saving the running configuration by “nv config save” and later uploading that file to an external provisioning server.

The textual configuration file can be created by running “nv config show -o commands” and pasting the output to the text file. That text file can be edited later to add more commands or replace the ones in the list.

ZTP can execute custom provisioning scripts. These scripts can be of any type, must include a shebang, and will run during the ZTP process.

### 5.17.1 Running DHCP-ZTP

There is no explicit command to enable ZTP. It is enabled by default. Disabling it is performed by a user-initiated configuration save (using the command “nv config save”). There are two ways to re-enable ZTP. The first one is to run a “reset factory” command, clearing the configuration of the switch and rebooting the system. The second one is to run “nv action run system ztp” which will just remove the startup configuration and restart ZTP. It is encouraged to run the “reset factory” command.

ZTP is based on DHCP. For ZTP to work, the software enables DHCP by default on all its management interfaces. The switch OS requests option 66 (tftp-server-name) and/or 67 (bootfile-name) from the DHCPv4 server or option 59 (bootfile-url) from the DHCPv6 server and waits for the DHCP responses containing the ZTP JSON configuration file URL. See ZTP Configuration File section for more information.

The DHCP server must be configured to send back the URL to the ZTP configuration file. For DHCPv4 there are two options supported: Option 66 and Option 67. Providing both options by DHCP server will result in combining them to build TFTP ULR to ZTP configuration file. When using Option 66 the TFTP protocol prefix is omitted. Providing only Option 67 will be considered as URL to the location of the ZTP configuration file.

For DHCPv6, the only option supported is Option 67. It will contain the complete URL to the ZTP JSON configuration file. The format of all the options is a string. Below is a summary table:

| DHCP Option | Name | Description |
|---|---|---|
| 66 | tftp-server-name | TFTP-Server address. If specified by server, must be used together with option 67. |
| 67 | bootfile-name | URL to download the ZTP JSON configuration file. It can also specify the ZTP JSON file path on TFTP server. |
| 59 | dhcp6.bootfile-url | URL to download the ZTP JSON configuration file. |

Examples of Options for DHCPv4:

```
option tftp-server-name "198.51.100.8";
option bootfile-name "ztp.json";
```

It will result in `tftp://192.51.100.1/ztp.json`

Example of only Option 67 for DHCPv4:

```
option bootfile-name "scp://<user>:<pass>@198.51.100.8/ztp.json";
```

Example of only Option 67 for DHCPv6:

```
option dhcp6.bootfile-url "http://[2001:db8::8]/ztp.json";
```

## 5.17.2 Dynamic Content Configuration

When a switch requests a file specified by a URL, it is expected that the server which is handling the request knows which file to be returned. For example, when a switch requests for configuration file, the server needs to be able to give out a configuration file for the requesting switch. This selection of the file can be done in two ways:

- Provisioning Server side: DHCP Options, HTTP Headers
- ZTP Client side: Dynamic URL (see ZTP Configuration File Section)

### 5.17.2.1 DHCP Options

To have the DHCP server discern the proper files based on switch-specific information, the NOS must provide identifying information for the server to classify the switches. NOS provides the following identifying information:

- Product Name—Option 61
- Serial Number—Option 61
- Vendor Class Identifier—Option 77 (Option 15 for DHCPv6)

Upon receiving such DHCP requests from a client, the server should be able to map the switch-specific information to the target file URLs according to predefined rules.

The following are the DHCP options sent by the NVOS switch in the DHCP request:

| DHCP Option | Name | Description |
|---|---|---|
| **61** | dhcp-client-identifier | Used to uniquely identify the switch initiating DHCP request. NVOS switches set this value:<br>For eth0:<br>"NVOS*##product-name##serial-no*"<br>For eth1:<br>"NVOS*##product-name##serial-no##interface-name*" |
| **77** | user-class | Used to optionally identify the type or category of user or applications it represents. NVOS switches set this value to "NVOS-ZTP". |
| **15** | dhcp6.user-class | Used to optionally identify the type or category of user or applications it represents. NVOS switches set this value to "NVOS-ZTP". |

### 5.17.2.2 HTTP Headers

For a server to make the decision on which file to serve out, it requires uniquely identifiable information about the requesting switch. Then, appropriate logic can be implemented on the server side to process the provided information, and identify and give out the requested file.

All HTTP/HTTPS requests made during ZTP contain switch identification information as part of HTTP headers. Below is the information that is included.

| Header | Value | Example |
|---|---|---|
| User-Agent | NVOS-ZTP/0.1 | |
| PRODUCT-NAME | *String specifying the switch model* | |
| SERIAL-NUMBER | *String specifying the manufacture provided serial number* | MT1234X56789 |
| BASE-MAC-ADDRESS | *Ethernet MAC Address assigned to the switch by the manufacturer* | 12:34:56:AB:CD:EF |
| NVOS-VERSION | *Version string as seen in 'nv show system version' command* | nvos-25.02.xxxx |
| NVUE-VERSION | *Version string as seen in 'nv show system version packages installed python3-nvue' command* | 2.X.X.X-nvos |

## 5.17.3 ZTP Configuration

### 5.17.3.1 ZTP Configuration File

For ZTP to automate the provisioning process a user needs to provide a JSON configuration file. The ZTP JSON configuration file consists of configuration sections (objects). Each section has its own options. In other words, ZTP JSON configuration file is an instruction on how to perform provisioning and from where to get provisioning data. Here is an example of the ZTP JSON configuration file:

```
{
 "ztp": {
    "01-image": {
      "install": {
        "url": "http://198.51.100.2/images/nvos.bin"
      },
      "uninstall": true
    },
    "02-commands-list": {
      "url": "sftp://user:password@198.51.100.3/configs/commands.txt",
      "clear-config": "true"
    },
    "03-startup-file": {
      "url": "scp://user:password@198.51.100.4/configs/config.yaml",
      "clear-config": false
    },
    "04-connectivity-check": {
      "ping-hosts": [ "198.51.100.5", "localhost" ]
      "ping-count": 10,
      "ignore-result": true
    },
    "05-provisioning-script": {
      "url": "scp://user:password@198.51.100.5/scripts/script.sh",
      "timeout": 300
    }
  }
}
```

The main section is “ztp” and it must always be present in the ZTP JSON configuration file. Inside the main section may have the following configuration sections:

- image—to manage system images on the switch
- commands-list—to apply CLI commands in textual form
- startup-file—to apply YAML formatted configuration
- connectivity-check—to check a connectivity to predefined location

The configuration sections are processed by ZTP software in lexical order so to control the order of execution, a “xx-“ prefix to the section names is allowed (e.g., 02-commands-list).

Each configuration section of ZTP JSON includes some common parameters that can be used to influence its execution. The default value for a parameter is assumed when the parameter is not specified in the configuration section:

- description: Optional free-form text string used to describe a configuration section defined in the ZTP JSON configuration file.
- ignore-result (default: false):
    - true—ZTP service marks status as SUCCESS even if an error is encountered while processing this individual section.
    - false—ZTP service marks status as FAILED if an error is encountered while processing this individual section.
- halt-on-failure (default: false):
    - true—If configuration section result is FAILED, ZTP service stops and exits immediately marking ZTP status as FAILED. No other configuration sections are processed. User intervention is needed to restart ZTP.
    - false—ZTP service moves on to next configuration section.
- restart-ztp-on-failure (default: true):
    - true—ZTP procedure is restarted if the result of ZTP is FAILED after processing all of the configuration sections defined in the ZTP JSON configuration file. This happens up to 10 times.
    - false—ZTP service exits after processing all of the configuration sections defined in the ZTP JSON configuration file.

And the main “ztp” section has its own parameter:

- restart-ztp-no-config (default: false):
    - true—ZTP procedure is restarted if switch startup configuration file is not present after the completion of processing the configuration sections defined in the ZTP JSON configuration file. This happens up to 10 times.
    - false—ZTP service exits after processing all of the configuration sections defined in the ZTP JSON configuration file even if the Switch startup configuration file is not present.

ZTP service exits and marks the status as FAILED if any errors are encountered while parsing the ZTP JSON configuration file. It is encouraged to check for any JSON format correctness before rolling out the ZTP JSON configuration file for use. When processing a configuration section and provided data is found to be insufficient, it is marked as failed and ZTP moves on to the next section.

### 5.17.3.2 ZTP Configuration image

The *image* configuration section is used for image management on a switch. It can be used to install and uninstall system images.

Example config section to install a new image and boot into it:

```
"image": {
    "install": {
        "url": "http://198.51.100.2/images/nvos.bin",
        "skip-reboot ": false
    }
}
Example config section to uninstall a NVOS image from the Switch:
```

```
"image": {
    "uninstall": true
}
```

Following is the list of parameters supported in image configuration section and their brief description with a default values. The default value for a parameter is assumed when the parameter is not used:

- install—Used to install an image using URL.
    - url/dynamic-url—Specifies the URL string from where the system image file has to be downloaded in the form of url or dynamic-url object.
    - skip-reboot (default: false)—Specifies if a switch reboot operation is performed immediately after installing a new switch image. Reboot is skipped when set to true.
- uninstall (default: false)—Used to uninstall an existing image on the disk.
    - true—Uninstall the image from the second partition.
    - false—Do nothing.

> ⚠ uninstall is first processed followed by install if both are defined.

### 5.17.3.3 ZTP Configuration startup-file

The *startup-file* configuration section is used to apply the switch configuration in form of YAML file and apply the configuration. The YAML file format of the configuration is the same as switch startup configuration file. Here is an example of startup-file configuration section:

```
"startup-file": {
    "url": "http://198.51.100.3/startup.yaml",
    "clear-config": true,
    "save-config": true
}
```

Following is the list of parameters supported by the startup-file configuration section:

- url/dynamic-url—Define the URL string from where the startup.yaml file has to be downloaded in the form of url or dynamic-url object.
- clear-config (default: true)—Use this to specify if the existing configuration has to be cleared before loading the download startup.yaml file content . When set to true, ZTP replaces all current configuration with startup.yaml file content. When set to false it merges the configurations.
- save-config (default: false)—Use this to perform config save command after loading the downloaded startup.yaml file.

> ⚠ Setting save-config parameter to true will save the configuration and hence disable the ZTP at the end of the ZTP session.

### 5.17.3.4 ZTP Configuration commands-list

The *commands-list* configuration section is used to apply switch configuration in form of CLI text commands. The list of commands is provided in text file which should be downloaded and applied. Commands' file must contain only non-interactive commands, otherwise it will fail entire *commands-list* section. It is user responsibility to make sure commands are non-interactive, for

example user should provide “force / -y / -n” or similar flags to the interactive CLI to prevent AYS (Are You Sure?) questions.

> ⚠ *Note: Running “system reboot” command will restart the switch and will restart ZTP flow for current section from the beginning resulting in boot-loop. Keep in mind that when defining commands-list text file.*

Example of commands-list configuration section:

```
"commands-list": {
    "url": "http://198.51.100.4/commands.txt",
    "clear-config": true,
    "save-config": true
}
```

Following is the list of parameters supported by the commands-list configuration section:

- url/dynamic-url—Define the URL string from where the commands-list file has to be downloaded in the form of url object or dynamic-url object.
- clear-config (default: true)—Use this to specify if the existing configuration has to be cleared before applying file content. If true, it applies empty (default) configuration prior executing commands.
- save-config (default: false)—Use this to perform a *config save* command after applying downloaded commands list.

> ⚠ Setting save-config parameter to true will save the configuration and hence disable the ZTP at the end of the ZTP session. The same behavior applies to “nv config save” command specified in commands-list text file.

### 5.17.3.5 ZTP Configuration connectivity-check

The *connectivity-check* section is used to ping a remote host and verify if the switch is able to reach the remote host. It is possible to ping multiple hosts and the plugin result is marked as failed even if ping to one of the specified host fails.

```
"connectivity-check": {
    "ping-hosts": [ "198.51.100.5", "localhost" ]
}
```

Following is the list of objects supported by the connectivity-check section:

- ping-hosts—List of IPv4 hosts to ping.
- ping6-hosts—List of IPv6 hosts to ping.
- retry-interval (default: 5)—Specify a timeout, in seconds, before retrying ping to a host.
- retry-count (default: 12)—Stop ping to a host and move on to the next host specified in the list after retrying specified count of times.
- ping-count (default: 3)—Stop after sending *count* ECHO_REQUEST packets.
  With *deadline* option, ping waits for *count* ECHO_REPLY packets, until the timeout expires.
- deadline (default: N/A)—Specify a timeout, in seconds, before ping exits regardless of how many packets have been sent or received. In this case ping does not stop after *count* packet

are sent, it waits either for *deadline* expire or until *count* probes are answered or for some error notification from network.

- timeout (default: N/A)—Time to wait for a response, in seconds. The option affects only timeout in absence of any responses, otherwise ping waits for two RTTs (Round Trip Time).

#### 5.17.3.6 ZTP Configuration provisioning-script

The provisioning-script plugin is used to download a file and execute it.
Files must include a shebang (e.g., bash, python, etc.).
Files must contain only non-interactive commands.
A non-zero exit code during file execution will result in failure of the provisioning-script section.

```
// ztp.json

{
    "ztp" : {
        "1-provisioning-script" : {
            "url" : "scp://user:password@server/path/to/script" ,
            "timeout" : 300
        }
    }
}
```

The following objects are supported by the provisioning script:

- url/dynamic-url)—Defines the URL from which to download the file.
- timeout)—Specifies the timeout in seconds (default is 300). The script will terminate and fail if this time is exceeded. This object is optional.
- Common objects)—Includes options like halt-on-failure, restart-ztp-on-failure, and others.

### 5.17.4 ZTP and OS Upgrade

Software upgrade from non-ZTP versions to ZTP versions and vice versa is supported. When upgrading from a non-ZTP version, ZTP is disabled because ZTP is always assumed to start with an empty configuration.

### 5.17.5 Example Configurations

#### 5.17.5.1 DHCPv4 Configuration

The following is a configuration example for ISC DHCPv4 server:

```
host master {
    hardware ethernet 12:34:56:AB:CD:EF;
    fixed-address 192.51.100.201;
    option bootfile-name "scp://<user>:<password>@192.51.100.8/ztp.json";
}
```

#### 5.17.5.2 DHCPv6 Configuration

The following is a DHCPv6 configuration example:

```
host master {
    ........
```

```
    option dhcp6.bootfile-url "http://[2001:db8::8]/ztp.json";
}
```

### 5.17.5.3 ZTP Configuration File Example

```
{
  "ztp": {
    "01-image": {
      "uninstall": true
    },
    "02-commands-list": {
      "url": "sftp://user:password@198.51.100.3/configs/commands.txt",
      "clear-config": "true"
    },
    "03-startup-file": {
      "url": "scp://user:password@198.51.100.4/configs/config.yaml"
    },
    "04-connectivity-check": {
      "ping-hosts": [ "198.51.100.5", "localhost" ],
    }
  }
}
```

### 5.17.5.4 Commands List Example

```
# Disable password hardening
nv set system security password-hardening state disabled

# Configure log rotation rules
nv set system log rotation frequency weekly

# Configure system message
nv set system message pre-login Hello

# Applying config
nv config apply -y
```

### 5.17.5.5 YAML Formatted File Configuration

```
- set:
    system:
      log:
        rotation:
          size: 30.0
      ntp:
        dhcp: disabled
        server:
          localntpserver: {}
          ua.pool.ntp.org:
            association-type: pool
      security:
        password-hardening:
          state: disabled
```

### 5.17.5.6 Provisioning Script Example

```
#!/bin/python
print("Hello world from Provisioning Script!")
```

## 5.17.6 Zero-Touch Provisioning Commands

- Zero-Touch Provisioning Commands

## 5.17.7 Zero-Touch Provisioning Commands

- 5.17.7.1 nv show system ztp

- 5.17.7.2 nv set system ztp config-save
- 5.17.7.3 nv action system ztp


## 5.17.7.1 nv show system ztp

| | | |
|---|---|---|
| | nv show system ztp<br>Shows global ZTP status and the status for each section. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |

```
admin@nvos:~$ nv show system ztp
            operational  applied
----------  -----------  --------
runtime      03m 53s
service      enabled
source       dhcp6-opt59
status       success
config-save  disabled     disabled


ZTP stages
=============
    Stage                    Exit Status  Ignore Result  Runtime  Status
    ----------------------   -----------  -------------  -------  -------
    00-image                 success      no             31s      success
    01-connectivity-check    success      no             03s      success
    03-startup-file          success      no             51s      success
    05-commands-list         success      no             31s      success
    10-connectivity-check    success      no             03s      success
    11-provisioning-script   success      no             02s      success




admin@nvos:~$ nv show system ztp
            operational  applied
----------  -----------  --------
service      inactive
state        disabled
status       not-started
config-save  disabled     disabled


ZTP stages
=============
No Data
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/ztp |
| Related Commands | nv set system ztp config-save |
| Notes | |

## 5.17.7.2 nv set system ztp config-save

| | | |
|---|---|---|
| | nv set system ztp config-save {enabled \| disabled}<br>Setting the ZTP configuration. | |
| Syntax Description | enabled, disabled | Enables or disables “nv config save” |
| Default | Disabled | |
| Configuration Mode | config | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv set system ztp config-save enabled`<br>`admin@nvos:~$ nv config apply`<br>`admin@nvos:~$ nv config save` |
| REST API | PATCH https://<ip>/nvue_v1/system/ztp |
| Related Commands | nv show system ztp |
| Notes | When ZTP is active, “nv config save” is suppressed because it may interfere with ZTP operation. Therefore, after running “nv set system ztp config-save enabled” and “nv config apply”, if “nv config save” is performed, then ZTP is disabled as a consequence of the database save. |

### 5.17.7.3 nv action system ztp

| | | |
|---|---|---|
| | nv action {abort \| run} system ztp [force]<br>ZTP action commands to interact with ZTP service. | |
| Syntax Description | abort | Abort ZTP session. This command is used to interrupt ongoing ZTP session. |
| | run | Rerun ZTP flow. Use this command to manually restart a new ZTP session from scratch or from when it failed or aborted. |
| | force | This option is used to skip AYS dialog. By default, each action command asks the user to confirm the execution of the specified command. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv action abort system ztp`<br>`The operation will perform abort of the ZTP.`<br>`Type [y] to perform abort of the ZTP.`<br>`Type [N] to cancel an action.`<br><br>`Do you want to continue? [y/N] y`<br>`Action executing ...`<br>`Aborting ZTP session`<br>`Action executing ...`<br>`Action succeeded`<br><br>`admin@nvos:~$ nv action run system ztp`<br>`The operation will perform rerun of the ZTP.`<br>`Type [y] to perform rerun of the ZTP.`<br>`Type [N] to cancel an action.`<br><br>`Do you want to continue? [y/N] y`<br>`Action executing ...`<br>`Rerunning ZTP session`<br>`Action executing ...`<br>`Action succeeded` | |
| REST API | POST https://<ip>/nvue_v1/system/ztp | |
| Related Commands | nv show system ztp | |
| Notes | • **nv action abort system ztp** command does not disable ZTP, in order to manually configure the device, please use "nv config save" first to fully disable ZTP process.<br>• **nv action run system ztp** command will bypass the action when configuration is saved or applied before. Please use reset factory command to clear configuration. | |

# 6 Chassis Management

The chassis manager provides the user access to the following information:

| Accessible Parameters | Description |
|---|---|
| switch temperatures | Displays system's temperature |
| switch leakage | Displays leakage sensors' status |
| fan unit | Displays system fans' status |
| power unit | Displays system power consumers |
| Flash memory | Displays information about system memory utilization. |

Additionally, it monitors:

- AC power to the PSUs
- DC power out from the PSUs
- Chassis failures
- Leakage detection from the switch tray

## 6.1 System Health Monitor

The system health monitor scans the system to decide whether or not the system is healthy. When the monitor discovers that one of the system's modules (leaf, spine, fan, or power supply) is in an unhealthy state or has returned from an unhealthy state, it notifies the users through the following methods:

- System logs—accessible to the user at any time as they are saved permanently on the system
- Status LEDs—changed by the system health monitor when an error is found in the system and is resolved

## 6.2 Leakage Sensors

The system will have 6 leakage sensors located in different locations. Once sensors detect leakage, NVOS will publish an event immediately and update system health accordingly. User will be able to see on which sensor it was detected using the 'nv show platform environment leakage' show command. Once leakage is redeemed, the sensors can re-arm automatically without the need to clear the sensors' leak state and it takes up to 1 hour.

## 6.3 Chassis Management Commands

- Chassis Information and Inventory
- Environment
- Software
- Transceiver

# 6.4 Chassis Information and Inventory

NVOS provides commands to display general platform information and inventory details.

## 6.4.1 Chassis Information and Inventory Commands

- Chassis Information and Inventory Commands

## 6.4.2 Chassis Information and Inventory Commands


- 6.4.2.1 nv show platform
- 6.4.2.2 nv show platform chassis-location
- 6.4.2.3 nv show platform inventory


### 6.4.2.1 nv show platform

| | | |
|---|---|---|
| | nv show platform<br>Displays the types of data available under more specific platform commands. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002<br>25.02.5002 Updated the output field "product-name" with "system type" | |
| Example | | |

```
admin@nvos:~$ nv show platform
                operational
-------------   ---------------------------------------------------
system-mac      B0:XX:XX:XX:XX:00
manufacturer    Nvidia
cpu             x86_64 Intel(R) Core(TM) i3-8100H CPU @ 3.00GHz x4
memory          15.0 GB
disk-size       149.1 GB
port-layout     73 x 800G
part-number     920-9B31-RX-5M0-NS
serial-number   MT2419X0XX13
asic-model      Quantum3
asic-revision   0x00A0
system-uuid     9XXXX582-XXXX-11ef-XXXX-b0cf0e6d9000
system-type     QM3400
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform |
| Related Commands | nv show platform environment<br>nv show platform firmware<br>nv show platform software |
| Notes | |

### 6.4.2.2 nv show platform chassis-location

| | | |
|---|---|---|
| | nv show platform chassis-location<br>Display chassis location information. | |
| Syntax Description | N/A | |
| Default | N/A | |

| | |
|---|---|
| History | 25.02.2002 |
| Example | |

```
admin@nvos:~$ nv show platform chassis-location
                operational
-----------     -----------
tray-index      0
slot-number     5
chassis-sn      999WWYY123456
topology-id     GB200 NVL36
```

| | |
|---|---|
| Related Commands | |
| Notes | |

### 6.4.2.3 nv show platform inventory

| | | |
|---|---|---|
| | nv show platform inventory {<inventory-id>}<br>Display the status of all platform components. Includes the following fields: hw-version, model, serial, state and type. | |
| Syntax Description | inventory-id | Display the status of a single platform component (with the same fields as the general command). |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000: Updated command output | |
| Example | | |

```
admin@nvos:~$ nv show platform inventory
        HW Version  Model                Serial         State  Type
------  ----------  -------------------  -------------  -----  ------
BMC     N/A         P3809                1333624062905  ok     bmc
FAN1/1  N/A         N/A                  N/A            ok     fan
FAN1/2  N/A         N/A                  N/A            ok     fan
FAN2/1  N/A         N/A                  N/A            ok     fan
FAN2/2  N/A         N/A                  N/A            ok     fan
FAN3/1  N/A         N/A                  N/A            ok     fan
FAN3/2  N/A         N/A                  N/A            ok     fan
FAN4/1  N/A         N/A                  N/A            ok     fan
FAN4/2  N/A         N/A                  N/A            ok     fan
SWITCH  A1          692-9K36F-A5MV-JQS   MT2441XXXX90   ok     switch


admin@nvos:~$ nv show platform inventory SWITCH
                  operational
----------------  -----------------
state             ok
hardware-version  A2
model             692-9K36F-00MV-JS0
serial            MT2416X02630
type              switch
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/inventroy/<br>GET https://<ip>/nvue_v1/platform/inventroy/{inventroy-id} |
| Related Commands | nv show platform |
| Notes | |

## 6.5 Environment

NVOS includes robust features for monitoring and managing the platform's environmental conditions, ensuring optimal performance and system reliability. These features provide detailed insights into critical hardware components and allow users to take control of specific environmental aspects.

## 6.5.1 Key Functionalities

- Fan Monitoring: Retrieve real-time status and performance of system fans.
- Power Supply Management: Monitor the health and functionality of power supply units (PSUs).
- Temperature Monitoring: Check temperature readings from various sensors.
- Voltage Monitoring: Inspect voltage levels and sensor data.
- Leakage Detection: Identify potential leakage scenarios.
- LED Control: Manage and monitor platform LEDs.

## 6.5.2 Environment Commands

- Environment Commands

## 6.5.3 Environment Commands


- 6.5.3.1 nv show platform environment
- 6.5.3.2 nv show platform environment fan
- 6.5.3.3 nv show platform environment led
- 6.5.3.4 nv show platform environment psu
- 6.5.3.5 nv show platform environment temperature
- 6.5.3.6 nv show platform environment voltage
- 6.5.3.7 nv show platform environment voltage sensor
- 6.5.3.8 nv action turn-on/turn-off platform environment led UID


### 6.5.3.1 nv show platform environment

| | | |
|---|---|---|
| | nv show platform environment<br>Displays the types of data available under more specific platform environment commands. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show platform environment
Name                              Type         State
--------------------------------  -----------  -----
ASIC                              temperature  ok
Ambient-Fan-Side-Temp             temperature  ok
CPU-Pack-Temp                     temperature  ok
FAN1                              led          off
FAN1/1                            fan          ok
FAN1/2                            fan          ok
FAN2                              led          off
FAN2/1                            fan          ok
FAN2/2                            fan          ok
FAN3                              led          off
FAN3/1                            fan          ok
FAN3/2                            fan          ok
FAN4                              led          off
FAN4/1                            fan          ok
FAN4/2                            fan          ok
FAN5                              led          off
FAN5/1                            fan          ok
FAN5/2                            fan          ok
FAN6                              led          off
FAN6/1                            fan          ok
FAN6/2                            fan          ok
HSC-VinDC-In                      voltage      ok
HSC-VinDC-Out                     voltage      ok
PDB-1-Conv-In-1                   voltage      ok
PDB-1-Conv-Out-1                  voltage      ok
PDB-2-Conv-In-1                   voltage      ok
PDB-2-Conv-Out-1                  voltage      ok
PDB-3-Conv-In-1                   voltage      ok
PDB-3-Conv-Out-1                  voltage      ok
PDB-4-Conv-In-1                   voltage      ok
PDB-4-Conv-Out-1                  voltage      ok
PMIC-1-12V-VDD-ASIC1-In-1         voltage      ok
PMIC-1-ASIC1-VDD-Out-1            voltage      ok
PMIC-2-12V-HVDD-DVDD-ASIC1-In-1   voltage      ok
PMIC-2-ASIC1-DVDD-PL0-Out-2       voltage      ok
PMIC-2-ASIC1-HVDD-PL0-Out-1       voltage      ok
PMIC-3-12V-HVDD-DVDD-ASIC1-In-1   voltage      ok
PMIC-3-ASIC1-DVDD-PL1-Out-2       voltage      ok
PMIC-3-ASIC1-HVDD-PL1-Out-1       voltage      ok
PMIC-4-12V-VDD-ASIC2-In-1         voltage      ok
PMIC-4-ASIC2-VDD-Out-1            voltage      ok
PMIC-5-12V-HVDD-DVDD-ASIC2-In-1   voltage      ok
PMIC-5-ASIC2-DVDD-PL0-Out-2       voltage      ok
PMIC-5-ASIC2-HVDD-PL0-Out-1       voltage      ok
PMIC-6-12V-HVDD-DVDD-ASIC2-In-1   voltage      ok
PMIC-6-ASIC2-DVDD-PL1-Out-2       voltage      ok
PMIC-6-ASIC2-HVDD-PL1-Out-1       voltage      ok
PMIC-7-12V-MAIN-In-1              voltage      ok
PMIC-7-CEX-VDD-Out-1              voltage      ok
PMIC-8-COMEX-VDD-MEM-In-1         voltage      ok
PMIC-8-COMEX-VDD-MEM-Out-1        voltage      ok
SODIMM-1-Temp                     temperature  ok
STATUS                            led          off
UID                               led          off
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/environment |
| Related Commands | nv show platform environment fan<br>nv show platform environment led<br>nv show platform environment temperature |
| Notes | |

## 6.5.3.2 nv show platform environment fan

| | | |
|---|---|---|
| | nv show platform environment fan <fan-id><br>Displays the maximum, minimum, current speed and state for one or all fans in the system. | |
| Syntax Description | fan-id | Name of the fan whose status to display. If not entered, all fans are displayed. |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show platform environment fan
Name    Fan State  Current Speed (RPM)  Max Speed  Min Speed  Fan Direction
------  ---------  -------------------  ---------  ---------  -------------
FAN1/1  ok         23045                33000      6000       B2F
FAN1/2  ok         21634                33000      6000       B2F
FAN2/1  ok         23557                33000      6000       B2F
FAN2/2  ok         22085                33000      6000       B2F
FAN3/1  ok         22555                33000      6000       B2F
FAN3/2  ok         22085                33000      6000       B2F
FAN4/1  ok         22555                33000      6000       B2F
FAN4/2  ok         22085                33000      6000       B2F
FAN5/1  ok         22555                33000      6000       B2F
FAN5/2  ok         22085                33000      6000       B2F
FAN6/1  ok         22555                33000      6000       B2F
FAN6/2  ok         21634                33000      6000       B2F

admin@nvos:~$ nv show platform environment fan FAN1/1
                 operational
-------------    -----------
state            ok
current-speed    22555
min-speed        6000
max-speed        33000
direction        B2F
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/environment/fan<br>GET https://<ip>/nvue_v1/platform/environment/fan/{fan-id} |
| Related Commands | nv show platform environment |
| Notes | |

## 6.5.3.3 nv show platform environment led

| | | |
|---|---|---|
| | nv show platform environment led <led-id><br>Displays the status of one or all LEDs in the system. | |
| Syntax Description | led-id | Name of the LED whose status to display. If not entered, all LEDs are displayed. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show platform environment led
LED Name  LED Color
--------  ---------
FAN1      off
FAN2      off
FAN3      off
FAN4      off
FAN5      off
FAN6      off
STATUS    green
UID       blue
```

```
admin@nvos:~$ nv show platform environment led UID
       operational
-----  -----------
color  blue
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/environment/led<br>GET https://<ip>/nvue_v1/platform/environment/led/{led-id} |
| Related Commands | nv show platform environment |
| Notes | |

### 6.5.3.4 nv show platform environment psu

| | | |
|---|---|---|
| | nv show platform environment psu <psu-id><br>Displays the capacity, current, power, voltage, and state for one or all PSUs in the system. | |
| Syntax Description | psu-id | Name of the PSU whose status is to be displayed. If psu-is is not specified, all PSUs are displayed. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show platform environment psu
Name  Capacity [W]  Current [A]  Power [W]  Voltage [V]  State
----  ------------  -----------  ---------  -----------  ------
PSU1  N/A           N/A          N/A        N/A          absent
PSU2  2200.00       0.53         120.84     228.00       ok
PSU3  2200.00       0.58         132.67     228.75       ok
PSU4  N/A           N/A          N/A        N/A          absent
PSU5  N/A           N/A          N/A        N/A          absent
PSU6  2200.00       0.64         145.60     227.50       ok
PSU7  2200.00       0.52         118.95     228.75       ok
PSU8  N/A           N/A          N/A        N/A          absent

admin @nvos :~$ nv show platform environment psu PSU3
          operational
--------  -----------
state     ok
capacity  2200.00
current   0.60
voltage   228.75
power     137.25
```

| | | |
|---|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/environment/psu<br>GET https://<ip>/nvue_v1/platform/environment/psu/<psu-id> | |
| Related Commands | nv show platform environment<br>nv show platform ps-redundancy | |
| Notes | • Depending on the system's power supply redundancy policy, not all PSUs must be present. Therefore, absent PSUs may not cause a system health issue.<br>• All PSU sockets must be populated either by a PSU or by a dummy PSU.<br>• PSUs without power will be in 'absent' state. | |

### 6.5.3.5 nv show platform environment temperature

| | | |
|---|---|---|
| | nv show platform environment temperature <sensor-id><br>Shows platform temperature and displays temperature information from different platform sensors. | |
| Syntax Description | sensor-id | Name of the sensor whose data to display. If not entered, all sensors are displayed. |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show platform environment temperature
Name                    Cur Temp (°C)  Crit Temp  Max Temp  Min Temp  State
----------------------  -------------  ---------  --------  --------  -----
ASIC                    47.00          105.00     120.00               ok
Ambient-Fan-Side-Temp   33.75                                          ok
CPU-Pack-Temp           70.00          100.00     95.00                ok
SODIMM-1-Temp           36.50          95.00      85.00                ok
```

```
admin@nvos:~$ nv show platform environment temperature CPU-Pack-Temp
         operational
-------  -----------
state    ok
current  46.12
max      95.00
crit     100.00
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/environment/temperature<br>GET https://<ip>/nvue_v1/platform/environment/temperature/<sensor-id> |
| Related Commands | nv show platform environment |
| Notes | Note the quotes needed for sensor ID containing a space. |

## 6.5.3.6 nv show platform environment voltage

| | |
|---|---|
| | nv show platform environment voltage<br>Displays a table with all voltage sensors located on the chassis. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | |

```
admin@nvos:~$ nv show platform environment voltage
Name                              Actual (V)  Maximum (V)  Minimum (V)  State
--------------------------------  ----------  -----------  -----------  -----
HSC-VinDC-In                      54.85       89.53        0.26         ok
HSC-VinDC-Out                     55.07                    0.52         ok
PDB-1-Conv-In-1                   53.75       64.00        35.56        ok
PDB-1-Conv-Out-1                  13.43       16.00        8.20         ok
PDB-2-Conv-In-1                   53.88       64.00        35.56        ok
PDB-2-Conv-Out-1                  13.41       16.00        8.20         ok
PDB-3-Conv-In-1                   53.81       64.00        35.56        ok
PDB-3-Conv-Out-1                  13.40       16.00        8.20         ok
PDB-4-Conv-In-1                   53.81       64.00        35.56        ok
PDB-4-Conv-Out-1                  13.44       16.00        8.20         ok
PMIC-1-12V-VDD-ASIC1-In-1         13.44       16.00        0.03         ok
PMIC-1-ASIC1-VDD-Out-1            1.43        1.64         1.44         ok
PMIC-2-12V-HVDD-DVDD-ASIC1-In-1   13.44       16.00        0.03         ok
PMIC-2-ASIC1-DVDD-PL0-Out-2       1.67        1.78         1.58         ok
PMIC-2-ASIC1-HVDD-PL0-Out-1       1.20        1.35         1.05         ok
PMIC-3-12V-HVDD-DVDD-ASIC1-In-1   13.38       16.00        0.03         ok
PMIC-3-ASIC1-DVDD-PL1-Out-2       1.68        1.78         1.58         ok
PMIC-3-ASIC1-HVDD-PL1-Out-1       1.20        1.35         1.05         ok
PMIC-4-12V-VDD-ASIC2-In-1         13.12       16.00        0.03         ok
PMIC-4-ASIC2-VDD-Out-1            1.43        1.64         1.44         ok
PMIC-5-12V-HVDD-DVDD-ASIC2-In-1   13.16       16.00        0.03         ok
PMIC-5-ASIC2-DVDD-PL0-Out-2       1.68        1.78         1.58         ok
PMIC-5-ASIC2-HVDD-PL0-Out-1       1.20        1.35         1.05         ok
PMIC-6-12V-HVDD-DVDD-ASIC2-In-1   13.09       16.00        0.03         ok
PMIC-6-ASIC2-DVDD-PL1-Out-2       1.70        1.78         1.58         ok
PMIC-6-ASIC2-HVDD-PL1-Out-1       1.20        1.35         1.05         ok
PMIC-7-12V-MAIN-In-1              13.12                                 ok
PMIC-7-CEX-VDD-Out-1              1.06        1.26         0.64         ok
PMIC-8-COMEX-VDD-MEM-In-1         13.00       17.00                     ok
PMIC-8-COMEX-VDD-MEM-Out-1        1.20        1.29         0.90         ok
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/environment/voltage |
| Related Commands | nv show platform environment voltage |
| Notes | |

### 6.5.3.7 nv show platform environment voltage sensor

| | |
|---|---|
| | nv show platform environment voltage <sensor-id><br>Display voltage of a specific sensor. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv show platform environment voltage PMIC-1-12V-VDD-ASIC1-In-1`<br>`  operational`<br>`------  -----------`<br>`state  ok`<br>`actual  13.44`<br>`max  16.00`<br>`min  0.03` |
| REST API | GET https://<ip>/nvue_v1/platform/environment/voltage/{sensor-id} |
| Related Commands | nv show platform environment voltage |
| Notes | This command is supported only on QM9700 platforms |

### 6.5.3.8 nv action turn-on/turn-off platform environment led UID

| | | |
|---|---|---|
| | nv action turn-on platform environment led UID<br>nv action turn-off platform environment led UID<br>Turns on/off the LED UID. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action turn-on platform environment led UID` | |
| REST API | POST https://<ip>/nvue_v1/platform/environment/led/UID | |
| Related Commands | | |
| Notes | | |

## 6.6 Software

NVOS provides tools to display the software packages installed on the system.

### 6.6.1 Software Commands

- Software Commands

## 6.6.2 Software Commands


- 6.6.2.1 nv show platform software
- 6.6.2.2 nv show platform software installed
- 6.6.2.3 nv show platform software installed id


### 6.6.2.1 nv show platform software

| | | |
|---|---|---|
| | nv show platform software<br>Display detailed platform software information installed. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.5002 | |
| Example | admin@nvos:~$ nv show platform software<br>Installed Software<br>==========<br>Installed Software  Description  Package  Version<br>---  ---  ---  ---<br>acpi  displays information on ACPI devices  acpi  1.7-1.2<br>... | |
| REST API | GET https://<ip>/nvue_v1/platform/software | |
| Related Commands | | |
| Notes | | |

### 6.6.2.2 nv show platform software installed

| | | |
|---|---|---|
| | nv show platform software installed<br>Displays the software packages installed in the system. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show platform software installed
Installed Software   Description                                          Package
 Version
-------------------  ---------------------------------------------------- ------------------
-------------
acpi                 displays information on ACPI devices                 acpi                1.7-1
.2
acl                  access control list - utilities                      acl                 2.2.5
3-10
adduser              add and remove users and groups                      adduser
3.118
apparmor             user-space parser utility for AppArmor               apparmor            2.13.6-
0
apt                  commandline package manager                          apt                 2.2.4
apt-transport-https  transitional package for https support               apt-transport-https 2.2.4
audisp-tacplus       audisp module for TACACS+ accounting                 audisp-tacplus      1.0.2
auditd               User space tools for security auditing               auditd              1:3.
0-2
base-files           Debian base system miscellaneous files               base-files          11.1+
deb11u3
base-passwd          Debian base system master password and group files   base-passwd         3.5.5
1
...
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/software/installed<br>GET https://<ip>/nvue_v1/platform/software/installed/{installed-id} |
| Related Commands | nv show platform |
| Notes | |

### 6.6.2.3 nv show platform software installed id

| | | |
|---|---|---|
| | show platform software installed <installed-id><br>Display the information for a specific installed software package. | |
| Syntax Description | installed-id | Package name (string) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show platform software installed acl
            operational
-----------  ------------------------------
package      acl
version      2.2.53-10
description  access control list - utilities
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/software/installed/{installed-id} |
| Related Commands | nv show platform |
| Notes | |

## 6.7 Transceiver

NVOS offers advanced features for managing and monitoring platform transceivers, ensuring seamless operation and optimal network performance. These features provide users with comprehensive tools for overseeing transceiver status, resetting devices, and managing firmware updates.

## 6.7.1 Key Functionalities

- Transceiver Status Monitoring: View detailed information about installed transceivers, including their operational state and specifications.
- Transceiver Reset: Perform targeted resets on specific transceivers to resolve issues or refresh their operational state.
- Firmware Management:
  - Install firmware files to update transceivers with the latest features and fixes
  - View the current firmware version of transceivers
  - List and inspect available firmware files

## 6.7.2 How to Install Transceiver Firmware

Follow the steps below for installing the transceiver firmware.

1. Fetch the firmware file.

```
admin@nvos:~$ nv action fetch platform firmware transceiver scp://username[:password]@hostname/path/
46_120_10010_dev_signed.bin
Password:
Action executing ...
File fetched successfully
Action succeeded
```

2. Install a transceiver firmware.

```
admin@nvos:~$ nv action install platform transceiver sw1 firmware files 46_120_10010_dev_signed.bin
Action executing ... 100%
Installed FW version: 46.120.10010
Action succeeded
```

## 6.7.3 Transceiver Commands

- Transceiver Commands

## 6.7.4 Transceiver Commands


- 6.7.4.1 nv show platform transceiver
- 6.7.4.2 nv action reset platform transceiver id
- 6.7.4.3 nv action install platform transceiver firmware files
- 6.7.4.4 nv show platform transceiver firmware
- 6.7.4.5 nv show platform transceiver firmware files
- 6.7.4.6 nv show platform transceiver firmware files name


### 6.7.4.1 nv show platform transceiver

| | | |
|---|---|---|
| | nv show platform transceiver [<transceiver-id>] [detail]<br>Display the status of all transceivers as a table. Includes fields such as cable-type, cable-length, vendor-rev, and identifier. | |
| Syntax Description | transceiver-id | Display the status of a single transceiver (with the same fields as the general command). |

| | | |
|---|---|---|
| | detail | Show detailed information for all all transceivers. |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output<br>25.02.5002 Added detail option | |

Example

```
admin@nvos:~$ nv show platform transceiver
Transceiver  Identifier                      Vendor name  Vendor PN         Vendor SN
Vendor revision  FW Version
-----------  ----------------------------  -----------  ----------------  -------------
---------------  -----------
fnm1         OSFP 8X Pluggable Transceiver  NVIDIA       980-9IAHB-00XM0N  MT2445FT25911  44
70.230.1023
sw9          OSFP 8X Pluggable Transceiver  NVIDIA       980-9IAHB-00XM0N  MT2443FT01087  44
70.230.1023
sw10         OSFP 8X Pluggable Transceiver  NVIDIA       980-9IAHB-00XM0N  MT2443FT01092  44
70.230.1023
sw61         OSFP 8X Pluggable Transceiver  NVIDIA       980-9IAHB-00XM0N  MT2443FT01104  44
70.230.1023
sw67         OSFP 8X Pluggable Transceiver  NVIDIA       980-9IAHB-00XM0N  MT2443FT01035  44
70.230.1023
sw68         OSFP 8X Pluggable Transceiver  NVIDIA       980-9IAHB-00XM0N  MT2443FT01097  44
70.230.1023
```

```
admin@nvos:~$ nv show platform transceiver detail

sw1:
  diagnostics-status     : Non present module
  status                 : Removed
  error-status           : N/A

sw2:
  diagnostics-status     : Non present module
  status                 : Removed
  error-status           : N/A

sw3:
  cable-type             : Optical module
  supported-cable-length : 500m SMF
  diagnostics-status     : Diagnostic Data Available
  status                 : Inserted
  error-status           : N/A
  vendor-data-code       : 2025-01-19
  identifier             : OSFP 8X Pluggable Transceiver
  vendor-rev             : 11
  vendor-name            : NVIDIA
  vendor-pn              : 980-9IAHA-00XM0L
  vendor-sn              : MT2503NS00754
  fw-version             : 130.1.0
  temperature:
    temperature         : 53.00 C
    high-alarm-threshold: 80.00 C
    low-alarm-threshold : -10.00 C
  voltage:
    voltage             : 3.25 V
    high-alarm-threshold: 3.50 V
    low-alarm-threshold : 3.10 V
  channel:
    channel-1:
      rx-power:
        power            : 2.64 mW / 4.22 dBm
        high-alarm-thresh: 7.00 dBm
        low-alarm-thresh : -9.83 dBm
      tx-power:
        power            : 2.20 mW / 3.42 dBm
        high-alarm-thresh: 7.00 dBm
        low-alarm-thresh : -6.82 dBm
      tx-bias-current:
        current          : 197.60 mA
        high-alarm-thresh: 480.00 mA
        low-alarm-thresh : 40.00 mA
      rx-cdr-lol    : False
      rx-los        : False
      tx-ad-eq-fault: False
      tx-cdr-lol    : False
      tx-los        : False
      tx-fault      : False
...
.....
```

```
admin@nvos:~$ nv show platform transceiver sw9

cable-type             : Optical module
supported-cable-length : 500m SMF
diagnostics-status     : Diagnostic Data Available
status                 : Inserted
error-status           : N/A
vendor-data-code       : 2024-10-21
identifier             : OSFP 8X Pluggable Transceiver
vendor-rev             : 44
vendor-name            : NVIDIA
vendor-pn              : 980-9IAHB-00XM0N
vendor-sn              : MT2443FT01087
fw-version             : 70.230.1023
temperature:
  temperature         : 53.00 C
  high-alarm-threshold: 75.00 C
  low-alarm-threshold : -10.00 C
```

```
  voltage:
    voltage             : 3.29 V
    high-alarm-threshold: 3.50 V
    low-alarm-threshold : 3.10 V
  mod-fw-fault           : False
  dp-fw-fault            : False
  channel:
    channel-1:
      rx-power:
          power            : 3.22 mW / 5.08 dBm
          high-alarm-thresh: 6.00 dBm
          low-alarm-thresh : -2.01 dBm
      tx-power:
          power            : 2.20 mW / 3.42 dBm
          high-alarm-thresh: 6.00 dBm
          low-alarm-thresh : 0.00 dBm
      tx-bias-current:
          current          : 103.05 mA
          high-alarm-thresh: 149.80 mA
          low-alarm-thresh : 50.00 mA
      rx-cdr-lol    : False
      rx-los        : False
      tx-ad-eq-fault: False
      tx-cdr-lol    : False
      tx-los        : False
      tx-fault      : False

    channel-2:
      rx-power:
          power            : 2.60 mW / 4.15 dBm
          high-alarm-thresh: 6.00 dBm
          low-alarm-thresh : -2.01 dBm
      tx-power:
          power            : 2.08 mW / 3.18 dBm
          high-alarm-thresh: 6.00 dBm
          low-alarm-thresh : 0.00 dBm
      tx-bias-current:
          current          : 125.83 mA
          high-alarm-thresh: 149.80 mA
          low-alarm-thresh : 50.00 mA
      rx-cdr-lol    : False
      rx-los        : False
      tx-ad-eq-fault: False
      tx-cdr-lol    : False
      tx-los        : False
      tx-fault      : False

   ...

    channel-8:
      rx-power:
          power            : 2.40 mW / 3.80 dBm
          high-alarm-thresh: 6.00 dBm
          low-alarm-thresh : -2.01 dBm
      tx-power:
          power            : 2.21 mW / 3.44 dBm
          high-alarm-thresh: 6.00 dBm
          low-alarm-thresh : 0.00 dBm
      tx-bias-current:
          current          : 107.92 mA
          high-alarm-thresh: 149.80 mA
          low-alarm-thresh : 50.00 mA
      rx-cdr-lol    : False
      rx-los        : False
      tx-ad-eq-fault: False
      tx-cdr-lol    : False
      tx-los        : False
      tx-fault      : False
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/transceiver/<br>GET https://<ip>/nvue_v1/platform/transceiver/{transceiver-id} |
| Related Commands | nv show platform |
| Notes | |

## 6.7.4.2 nv action reset platform transceiver id

| | | |
|---|---|---|
| | nv action reset platform transceiver <transceiver-id><br>Reset specific transceiver module | |
| Syntax Description | transceiver-id | The name of the transceiver |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv action reset platform transceiver sw1`<br>`Action executing ...`<br>`Resetting module sw1 ... OK`<br>`Action succeeded`<br><br>`admin@nvos:~$ nv action reset platform transceiver sw1`<br>`Action executing ...`<br>`Resetting module sw1 ... Failed`<br>`Action succeeded` |
| REST API | POST https://<ip>/nvue_v1/platform/transceiver/{transceiver-id} |
| Related Commands | nv show platform transceiver <transceiver-id> firmware |
| Notes | |

### 6.7.4.3 nv action install platform transceiver firmware files

| | | |
|---|---|---|
| | nv action install platform transceiver <transceiver-id> firmware files <file-name><br>Install firmware image file on the specific transceiver module. | |
| Syntax Description | transceiver-id | The name of the transceiver |
| | file-name | The name of the FW image file |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv action install platform transceiver sw1 firmware files`<br>`sec_issu_46_120_10010_dev_signed.bin`<br>`Action executing ... 100%`<br>`Installed FW version: 46.120.10010`<br>`Action succeeded`<br><br>`admin@nvos:~$ nv action install platform transceiver sw5 firmware files`<br>`sec_issu_46_120_10011_dev_signed.bin`<br>`Error: Action failed with the following issue:`<br>`  FW update is not supported for this module: no FW mgmt data is found` | |
| REST API | POST https://<ip>/nvue_v1/platform/transceiver/{transceiver-id}/firmware/files/{file-name} | |
| Related Commands | nv show platform transceiver <transceiver-id> firmware<br>nv show platform transceiver <transceiver-id> firmware files | |
| Notes | Burning new firmware version is not supported for copper cables. | |

### 6.7.4.4 nv show platform transceiver firmware

| | | |
|---|---|---|
| | nv show platform transceiver <transceiver-id> firmware<br>Display firmware information for specific transceiver module | |
| Syntax Description | transceiver-id | The name of the transceiver |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show platform transceiver sw1 firmware
                    operational         applied
------------------  ------------------  -------
actual-firmware      46.140.1013
fw-upgrade-status    N/A
fw-upgrade-error-msg N/A

admin@nvos:~$ nv show platform transceiver sw2 firmware
                    operational         applied
------------------  ------------------  -------
actual-firmware      47.120.10013
fw-upgrade-status    OK
fw-upgrade-error-msg N/A
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/transceiver/{transceiver-id}/firmware |
| Related Commands | nv action install platform transceiver <transceiver-id> firmware files {file-name}<br>nv action reset platform transceiver <transceiver-id> |
| Notes | |

## 6.7.4.5 nv show platform transceiver firmware files

| | | |
|---|---|---|
| | nv show platform transceiver <transceiver-id> firmware files<br>Display available firmware files for transceiver module | |
| Syntax Description | transceiver-id | The name of the transceiver |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show platform transceiver sw3 firmware files
Available firmware files  File path
------------------------  ----------------------
fw1.bin                   /host/fw-images/modules/fw1.bin
fw2.bin                   /host/fw-images/modules/fw2.bin
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/transceiver/{transceiver-id}/firmware/files |
| Related Commands | nv action install platform transceiver <transceiver-id> firmware files {file-name}<br>nv action reset platform transceiver <transceiver-id><br>nv show platform transceiver <transceiver-id> firmware |
| Notes | |

## 6.7.4.6 nv show platform transceiver firmware files name

| | | |
|---|---|---|
| | nv show platform transceiver <transceiver-id> firmware files <file-name><br>Display specific firmware file for transceiver module | |
| Syntax Description | transceiver-id | The name of the transceiver |
| | file-name | The name of the FW image file |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show platform transceiver sw3 firmware files fw1.bin
Available firmware files  File path
------------------------  ----------------------
fw1.bin                   /host/fw-images/modules/fw1.bin
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/platform/transceiver/{transceiver-id}/firmware/files/{file-name} |
| Related Commands | nv action install platform transceiver <transceiver-id> firmware files {file-name}<br>nv action reset platform transceiver <transceiver-id><br>nv show platform transceiver <transceiver-id> firmware |
| Notes | |

# 7 Configuration Management


- 7.1 Managing Configurations as Revisions
- 7.2 Restoring Factory Default Configuration
- 7.3 Configuration Management Commands


NVOS provides commands to efficiently manage and apply configurations on the system. These commands allow users to create, view, modify, compare, and save configurations to ensure consistent and accurate network setup. Whether user is making incremental updates, examining configuration differences, or saving changes for persistence across reboots, these tools offer flexibility and control over the system's operational state.

## 7.1 Managing Configurations as Revisions

NVOS utilizes a revision-based method to manage system configurations effectively. Each configuration change creates a unique revision, providing a clear and structured way to track, compare, and revert modifications.

- Creating Revisions:
  - A new revision is automatically generated whenever user set a configuration using `nv set *`.
  - All subsequent commands will be attached to last created revision.
  - Revision can be applied on system using `nv config apply`.
  - After a revision is applied, it becomes the "applied" revision and cannot be modified further.
  - Each revision includes metadata such as the revision ID, timestamp, the user who made the change, and the method of application (e.g., CLI or API).
- Viewing Revisions:
  - Use the `nv config revision` command to list all stored revisions. This provides a chronological history of all configuration changes made on the system.
- Tracking Changes:
  - The `nv config history` command provides detailed information about revisions, including who made the changes, when they were made, and how they were applied.
- Comparing Revisions:
  - Use `nv config diff <revision> <revision>` to identify differences between two revisions.
  - Compare the current pending configuration with the applied configuration to preview changes before applying them.
- Reverting to a Previous Revision:
  - If a configuration change causes issues, revert to a previous revision using `nv config apply <revision>`.
  - This allows to restore the system to a stable state without manually re-entering configurations.
- Persistence:

    - Changes made to configurations do not persist after a reboot unless explicitly saved using `nv config save`. Saving writes the current configuration to the startup file, making it the default state after a system restart.
- Patch/Replace Configuration:
    - Batch execution support for configuration commands, enabling users to process multiple `nv set` and `nv unset` commands or YAML file as a single atomic transaction through both REST API and CLI interfaces.
    - Use `nv config patch <file>` to update the pending revision with new configurations to or `nv config replace` to replace the pending revision.
    - Commands are submitted in plain-text format and executed as an all-or-nothing operation—if any single command fails, the entire batch is rejected and the revision remains unchanged, ensuring configuration consistency.
    - Supports abbreviated command syntax, Patch security commands when sensitive information is replaced with hashed value.
    - Provides detailed error reporting (including line numbers for invalid commands)

## 7.2 Restoring Factory Default Configuration

Restore to factory default is used when the configuration is corrupted or when there is a need to start the system with default configuration (e.g., when the system is being introduced into a new network).

The "keep" parameter allows to specify different levels of a factory reset. Each option determines which parts of the system configuration, files, and logs are retained or erased. Below are the available options:

1. Full Factory Reset (default): If no specific option is selected, a full reset is performed. This option erases all configuration settings, system files, and log files.

```
admin@nvos:~$ nv action reset system factory-default
```

2. **`keep all-config`**: This option preserves all system configurations but removes system files and log files. Use this option when you need to retain the configuration but clear any logs or system files.

```
admin@nvos:~$ nv action reset system factory-default keep all-config
```

3. **`keep basic`**: This option keeps only the basic configuration necessary to maintain system connectivity while removing most of the configuration, system files, and log files. The following settings are retained:
    a. Management interface (eth0, eth1)
    b. Local AAA users and their roles
    c. Password hardening rules
    d. SSH server configuration
    e. DNS server configuration

```
admin@nvos:~$ nv action reset system factory-default keep basic
```

4. `keep only-files` : This option removes all system configuration but retains system and log files. This can be useful for debugging purposes while clearing the configuration.

```
admin@nvos:~$ nv action reset system factory-default keep only-files
```

> ⚠ When doing Reset Factory, the SSD password will be reset to the default password value.

# 7.3 Configuration Management Commands

- Configuration Management Commands

# 7.4 Configuration Management Commands


- 7.4.1 Config
  - 7.4.1.1 nv config apply
  - 7.4.1.2 nv config detach
  - 7.4.1.3 nv config diff
  - 7.4.1.4 nv config find
  - 7.4.1.5 nv config history
  - 7.4.1.6 nv config patch
  - 7.4.1.7 nv config replace
  - 7.4.1.8 nv config save
  - 7.4.1.9 nv config show
  - 7.4.1.10 nv show system config files
  - 7.4.1.11 nv show system config files
  - 7.4.1.12 nv show system config files brief
  - 7.4.1.13 nv action export system config
  - 7.4.1.14 nv action rename system config files
  - 7.4.1.15 nv action delete system config files
  - 7.4.1.16 nv action delete system config files
  - 7.4.1.17 nv action upload system config files
  - 7.4.1.18 nv action fetch system config files
- 7.4.2 Factory
  - 7.4.2.1 nv action reset system factory-default


## 7.4.1 Config

### 7.4.1.1 nv config apply

| | |
|---|---|
| | nv config apply [--assume-yes\| --y\| --assume-no\| --confirm <time>\| --confirm-status]<br>Applies the pending configuration to become the applied configuration. |

| | | |
|---|---|---|
| Syntax Description | --assume-yes \| --y \| --assume-no | Automatically reply yes/no to all prompts. |
| | --confirm | Applies the configuration change but you must confirm the applied configuration. If you do not confirm within ten minutes, the configuration rolls back automatically.<br>You can change the default time with the time argument |
| | --confirm-status | Shows the amount of time left before the automatic rollback. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <pre>admin@nvos:~$ nv config apply<br>Warning: management interface config is changed. If you are connected with it, your conection may be temporary interrupted.<br><br>Are you sure? [y/N] y<br>applied</pre> | |
| REST API | PATCH https://<ip>/nvue_v1/revision/{revision-id} *-H 'Content-Type: application/json' -d '{"state": "apply", "auto-prompt": {"ays": "ays_yes"}}'* | |
| Related Commands | | |
| Notes | NVOS applies but does not save the configuration; the configuration does not persist after a reboot. | |

### 7.4.1.2 nv config detach

| | |
|---|---|
| | nv config detach<br>Detaches the configuration from the current pending configuration. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | <pre>admin@nvos:~$ nv config detach</pre> |
| REST API | DELETE https://<ip>/nvue_v1/revision/{revision-id} |
| Related Commands | |
| Notes | NVOS names the detached configuration pending and includes a timestamp with extra characters. For example: pending_20210128_212626_4WSY |

### 7.4.1.3 nv config diff

| | | |
|---|---|---|
| | nv config diff <revision> <revision> \| [ o commands ] \| [ --expand ]<br>Shows differences between configurations, such as the pending configuration and the applied configuration or the detached configuration and the pending configuration. | |
| Syntax Description | revision | pending configuration / applied configuration / detached configuration / startup configuration |
| | -o commands | Shows differences between two configuration revisions. |
| | --expand | Show the configuration in expanded form with no ranges. |

| | |
|---|---|
| Default | N/A |
| History | 25.02.2002<br>25.02.6077 Added --expand option |
| Example | <br>`admin@nvos:~$ nv config diff applied pending`<br>`- set:`<br>`  interface:`<br>`  swp1:`<br>`  description: Test`<br><br>`admin@nvos:~$ nv config diff`<br>`- set:`<br>`  interface:`<br>`  eth0:`<br>`  description: eth0-desc`<br>`  eth0-1:`<br>`  type: eth`<br>`  eth1:`<br>`  description: eth1-desc`<br><br>`admin@nvos:~$ nv config diff --expand`<br>`- set:`<br>`  interface:`<br>`  eth0:`<br>`  description: eth0-desc`<br>`  type: eth`<br>`  eth1:`<br>`  description: eth1-desc`<br>`  type: eth` |
| REST API | GET https://<ip>/nvue_v1/<resource>?rev=<rev-A>&diff=<rev-B><br>GET https://<ip>/nvue_v1/<resource>?rev=<rev-A>&diff=<rev-B>&expand=true |
| Related Commands | |
| Notes | |

## 7.4.1.4 nv config find

| | | |
|---|---|---|
| | nv config find <string> \| [ o commands ] \| [ --expand ]<br>Finds a portion of the applied configuration according to the provided string. | |
| Syntax Description | string | Search string |
| | -o commands | Shows the configurations as commands |
| | --expand | Show the configuration in expanded form with no ranges. |
| Default | N/A | |
| History | 25.02.2002<br>25.02.6077 Added --expand option | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv config find eth`<br>`- set:`<br>`  interface:`<br>`  eth0:`<br>`  description: eth0-desc`<br>`  eth0-1:`<br>`  type: eth`<br>`  eth1:`<br>`  description: eth1-desc`<br><br>`admin@nvos:~$ nv config find eth --expand`<br>`- set:`<br>`  interface:`<br>`  eth0:`<br>`  description: eth0-desc`<br>`  type: eth`<br>`  eth1:`<br>`  description: eth1-desc`<br>`  type: eth` |
| REST API | GET https://<ip>/nvue_v1/?rev=applied&filled=False&diff=&search-string=<string><br>GET https://<ip>/nvue_v1/?rev=applied&filled=False&diff=&search-string=<string>&expand=true |
| Related Commands | |
| Notes | |

### 7.4.1.5 nv config history

| | | |
|---|---|---|
| | nv config history <revision><br>Shows the apply history for the revision. | |
| Syntax Description | revision | pending configuration, applied configuration, detached configuration, startup configuration |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv config history 254`<br>`Currently pending [rev_id: 435]`<br>`Rev ID  Apply Date  Type  User  Message`<br>`------  ----------  ----  -----  ----------`<br>`254  2025-08-31T10:53:22+03:00  CLI  admin  Config update by admin` | |
| REST API | GET https://<ip>/nvue_v1/revision/{revision-id} OR GET https://<ip>/nvue_v1/revision | |
| Related Commands | | |
| Notes | | |

### 7.4.1.6 nv config patch

| | | |
|---|---|---|
| | nv config patch <file><br>Updates the pending configuration with the specified YAML configuration file or a text file containing NVUE commands. | |
| Syntax Description | <file> | configuration file |
| Default | N/A | |

| | |
|---|---|
| History | 25.02.2002<br>25.02.6077 Added support for text file containing NVUE commands and added example |
| Example | Example 1:<br>`admin@nvos:~$ nv config patch /deps/nv-02/13/2021.yaml`<br>Example 2: Path to text file contains NVUE commands<br>`admin@nvos:~$ nv config patch commands.txt`<br>`created [rev_id: 1]`<br>`admin@nvos:~$ nv config diff`<br>`- set:`<br>`  interface:`<br>`  acp138:`<br>`  description: Uplink to spine`<br>`  link:`<br>`  state:`<br>`  up: {}`<br>`  acp139:`<br>`  link:`<br>`  state:`<br>`  down: {}`<br>`admin@nvos:~$ nv config apply -y`<br>`applied [rev_id: 1]` |
| REST API | N/A |
| Related Commands | nv config apply |
| Notes | |

## 7.4.1.7 nv config replace

| | | |
|---|---|---|
| | nv config replace <file><br>Replaces the pending configuration with the specified YAML configuration file or text file containing NVUE commands. | |
| Syntax Description | <file> | configuration file |
| Default | N/A | |
| History | 25.02.2002<br>25.02.6077 Added support for text file containing NVUE commands and added example | |
| Example | `admin@nvos:~$ nv config replace /deps/nv-02/13/2021.yaml`<br>`admin@nvos:~$ nv config replace config_backup.txt`<br>`created [rev_id: 6]`<br>`admin@juliet-184-mgmt2:~$ nv config apply`<br>`Warning: current hostname `changed-config` will be replaced with `initial-config``<br>`Are you sure? [y/N] y`<br>`applied [rev_id: 6]` | |
| REST API | POST https://<ip>/nvue_v1/revision &<br>DELETE https://<ip>/nvue_v1/?rev=<rev-id> &<br>Update the configuration: PATCH https://<ip>/nvue_v1/?rev=<rev-id><br>Apply changes: PATCH https://<ip>/nvue_v1/revision/{revision-id} -H 'Content-Type: application/json' -d '{"state": "apply", "auto-prompt": {"ays": "ays_yes"}}' | |

| | |
|---|---|
| Related Commands | nv config apply |
| Notes | The replace operation will wipe the default ACL rules for management ports. These rules must be explicitly added to the new configuration file. |

### 7.4.1.8 nv config save

| | |
|---|---|
| | nv config save<br>Overwrites the startup configuration with the applied configuration. The configuration persists after a reboot. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv config save` |
| REST API | PATCH https://<ip>/nvue_v1/revision/{revision-id} *-H 'Content-Type: application/json' -d '{"state": "save", "auto-prompt": {"ays": "ays_yes"}}'* |
| Related Commands | |
| Notes | |

### 7.4.1.9 nv config show

| | | |
|---|---|---|
| | nv config show [ o commands ] \| [ --expand ]<br>Shows the currently applied configuration in `yaml` format. | |
| Syntax Description | -o commands | Shows the currently applied configuration commands. |
| | --expand | Show the configuration in expanded form with no ranges. |
| Default | N/A | |
| History | 25.02.2002<br>25.02.6077 Added --expand option | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv config show -o commands`<br>`nv set interface swp1 link state down`<br>`nv set interface swp1 type ib`<br><br>`admin@nvos:~$ nv config show`<br>`- set:`<br>`  interface:`<br>`  eth0:`<br>`  description: eth0-desc`<br>`  eth0-1:`<br>`  type: eth`<br>`  eth1:`<br>`  description: eth1-desc`<br><br>`admin@nvos:~$ nv config show --expand`<br>`- set:`<br>`  interface:`<br>`  eth0:`<br>`  description: eth0-desc`<br>`  type: eth`<br>`  eth1:`<br>`  description: eth1-desc`<br>`  type: eth` |
| REST API | GET https://<ip>/nvue_v1/?rev=applied&filled=false<br>GET https://<ip>/nvue_v1/?rev=applied&filled=false&expand=true |
| Related Commands | |
| Notes | |

## 7.4.1.10 nv show system config files

| | |
|---|---|
| | nv show system config files<br>Lists the configuration files. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show system config files`<br>`Available config files  File Path`<br>`---------- -------`<br>`config-file.yaml  /host/config_files/config-file.yaml` |
| REST API | GET https://<ip>/nvue_v1/system/config/files |
| Related Commands | |
| Notes | |

## 7.4.1.11 nv show system config files

| | | |
|---|---|---|
| | nv show system config files <file-id><br>Get a configuration file. | |
| Syntax Description | file-id | the file name to interact with |
| Default | N/A | |

| | |
|---|---|
| History | 25.02.2002 |
| Example | ```
- header:
    model: VX
    nvue-api-version: nvue_v1
    rev-id: 1.0
    version: Cumulus Linux 5.4.0
- set:
    system:
      message:
        pre-login: Hello
/etc/nvue.d/config_files/config_file.yaml (END)
```  |
| REST API | GET https://<ip>/nvue_v1/system/config/files/{file-name} |
| Related Commands | |
| Notes | The command will display the content of the configuration file in 'less' format |

### 7.4.1.12 nv show system config files brief

| | | |
|---|---|---|
| | nv show system config files <file-id> brief<br>Get a configuration file. | |
| Syntax Description | file-id | the file name to interact with |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | ```
admin@nvos:~$ nv show system config files config-file.yaml brief
Available config files  File path
----------------------  ----------------------------------------
config-file.yaml        /etc/nvue.d/config_files/config-file.yaml
```  | |
| REST API | GET https://<ip>/nvue_v1/system/config/files/{file-name} | |
| Related Commands | | |
| Notes | the command will display the path to the file | |

### 7.4.1.13 nv action export system config

| | | |
|---|---|---|
| | nv action export system config <file-id><br>Export configuration file. | |
| Syntax Description | file-id | the file name to interact with |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | ```
admin@nvos:~$ nv action export system config new_confif_file.yml
Exporting completed
Action succeeded
```  | |
| REST API | POST https://<ip>/nvue_v1/system/config/files/{file-name} | |
| Related Commands | | |
| Notes | This command will export the applied configuration a new config file. | |
```

### 7.4.1.14 nv action rename system config files

| | | |
|---|---|---|
| | nv action rename system config files <file-id> <new-name><br>Rename config file. | |
| Syntax Description | file-id | the file name to interact with |
| | new-name | the new name to rename to |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action rename system config new_config_file.yml new_name.yaml`<br>`config file new_config_file.yaml renamed to new_name.yaml`<br>`Action succeeded` | |
| REST API | POST https://<ip>/nvue_v1/system/config/files/{file-name} | |
| Related Commands | | |
| Notes | | |

### 7.4.1.15 nv action delete system config files

| | |
|---|---|
| | nv action delete system config files<br>Delete all config files. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv action rename system config new_config_file.yml new_name.yaml`<br>`config file new_config_file.yaml renamed to new_name.yaml`<br>`Action succeeded` |
| REST API | POST https://<ip>/nvue_v1/system/config/files |
| Related Commands | |
| Notes | |

### 7.4.1.16 nv action delete system config files

| | | |
|---|---|---|
| | nv action delete system config files <file-id><br>Delete config file. | |
| Syntax Description | file-id | The file name to interact with |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action rename system config new_config_file.yml new_name.yaml`<br>`config file new_config_file.yaml renamed to new_name.yaml`<br>`Action succeeded` | |

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/config/files/{file-name} |
| Related Commands | |
| Notes | |

## 7.4.1.17 nv action upload system config files

| | | |
|---|---|---|
| | nv action upload system config files <file-id> <remote-url><br>Upload config file. | |
| Syntax Description | file-id | The file name to interact with |
| | remote-url | Destination image file name<br>Remote url path to upload a file to.<br>Format: [protocol]://username[:password]@hostname/path/filename<br>Supported protocols: SCP, FTP, SFTP, and HTTPS |
| Default | N/A | |
| History | 25.02.2002<br>25.02.4002: Added HTTPS support in remote-url | |
| Example | | |

```
admin@nvos:~$ nv action upload system config files new_config_file.yml scp://
username:password@server/tmp/
Uploading file: new_config_file.yml ...
File upload successfully
Action succeeded
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/config/files/{file-name} |
| Related Commands | |
| Notes | |

## 7.4.1.18 nv action fetch system config files

| | | |
|---|---|---|
| | nv action fetch system config files <remote-url><br>Fetch configuration file. | |
| Syntax Description | remote-url | • Remote url path to fetch file from.<br>• Format: [protocol]://username[:password]@hostname/path/filename<br>• Supported protocols: SCP, HTTPS, FILE, FTP, and SFTP.<br>• The password must be encoded if it contains special characters and is provided as part of the command. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv action fetch system config scp://username:password@server/tmp/
new_config_file.yml
admin@nvos:~$ nv action fetch system config file:///tmp/new_config_file.yml
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/config/files/{file-name} |
| Related Commands | |

| | |
|---|---|
| Notes | Alternatively, you can upload a config file from the host machine to the switch.<br>Note: you must copy a config to the predefined directory: "/host/config_files/"<br>`user@host:~$ scp <path-to-config-file> <switch-admin-username>@<switch-ip-address>:/host/config_files/<desired-name>.yaml` |

## 7.4.2 Factory

### 7.4.2.1 nv action reset system factory-default

| | | |
|---|---|---|
| | nv action reset system factory-default [force]<br>Clears the system and resets it entirely to its factory state. | |
| Syntax Description | force | Forces a reboot and configuration reset regardless of the prompt answer |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv action reset system factory-default
The operation will reset the system configuration and initiate a reboot.
Type [y] to reset the system configuration and reboot.
Type [N] to abort.

Do you want to continue? [Y/N] N
Reset factory aborted by user
```

| | |
|---|---|
| REST API | POST https://<ip>/nvue_v1/system/ |
| Related Commands | |
| Notes | • The command will reboot the system.<br>• The SSD password will be reset to its default value. |

# 8 Telemetry Streaming

The following pages provide telemetry-related information.


- gNMI Streaming
- SNMP


## 8.1 gNMI Streaming


- 8.1.1 Configure the gNMI Agent using NVUE CLI Commands
- 8.1.2 Supported Subscription Modes
  - 8.1.2.1 Supported Models
- 8.1.3 gNMI Client Requests
- 8.1.4 Related Information
- 8.1.5 gNMI Streaming Commands


The gRPC Network Management Interface (gNMI) can collect and export system resources, interface, and counter information from NVOS to your gNMI client.

### 8.1.1 Configure the gNMI Agent using NVUE CLI Commands

The gNMI server feature state can be set over NVOS using simple NVUE CLI commands:

Show command:

```
nvos@switch:~$ nv show system gnmi-server
             operational    applied
-----------  -------------  -----------
state        enabled        enabled
certificate  self-signed    self-signed
is-running   yes
version      4.13.0-3000-2
```

Set command:

```
nvos@switch:~$ nv set system gnmi-server state <enabled | disabled>
```

Unset command:

```
nvos@switch:~$ nv unset system gnmi-server state
```

The state is enabled by default and the unset command will restore the state to enabled, if it is not already.

### 8.1.2 Supported Subscription Modes

NVOS supports the following gNMI subscription modes:

- STREAM Mode: In this mode, the client subscribes to receive updates whenever there is a change in the telemetry data. This mode is suitable for scenarios where you need real-time notifications of data changes.

- ONCE Mode: This mode retrieves the data once and then terminates the subscription. It's ideal for scenarios where a single snapshot of the data is needed without ongoing updates.
- POLL Mode: In this mode, the client periodically requests data from the server. This mode allows clients to fetch data at defined intervals, providing a balance between real-time and scheduled updates.

Supported stream modes:

- `ON_CHANGE` - when a subscription is defined to be "on change", data updates are only sent when the value of the data item changes.
- `SAMPLE` - This mode allows clients to receive periodic samples of telemetry data at specified intervals. This mode is beneficial for scenarios where continuous streaming of data is not necessary, but periodic updates are required for monitoring and analytics.

Key Parameters for STREAM SAMPLE Mode:

- sample_interval (mandatory): Defines the interval at which samples are sent to the client. This parameter controls the frequency of data transmission.
- suppress_redundant (optional, default false): Determines whether redundant data updates, which have not changed since the last sample, should be suppressed. This helps in reducing unnecessary data transmission and optimizing network usage.
- heartbeat_interval (optional, default disabled): Specifies the interval for sending heartbeat messages to indicate that the connection is still active. Heartbeats help in monitoring the health of the connection and detecting failures.

### 8.1.2.1 Supported Models

NVOS supports the following OpenConfig models (v4.3.0)

| Model | Supported Data |
|---|---|
| openconfig-interfaces | Name, Operstatus, AdminStatus, IfIndex, Description, Enabled, Counters (InPkts, OutPkts, InOctets, InUnicastPkts, InDiscards, InMulticastPkts, InErrors, OutOctets, OutUnicastPkts, OutMulticastPkts, OutDiscards, OutErrors) |
| openconfig-platform-cpu | OperStatus, Utilization |
| openconfig-platform-fan | OperStatus, Speed |
| openconfig-transceiver | OperStatus, InputPower, OutputPower, LaserBiasCurrent, LaserTemperature, Present, SupplyVoltage, FormFactor, VendorPart, SerialNo, Sevirty, Thresholds/LaserTemperatureLower, Thresholds/LaserTemperatureUpper |
| openconfig-system | Hostname, MacAddress, BootTime |

NVOS supports the following NVIDIA models:

| Model |
|---|
| nvidia-interfaces-infiniband |
| nvidia-interfaces-infiniband-errors-ext |
| nvidia-platform-general-ext |

| Model |
| --- |
| nvidia-platform-asic |
| nvidia-system-events |
| nvidia-if-phy-diag |
| nvidia-platform-transceiver-diag |
| nvidia-platform-general-ext-versions |
| nvidia-platform-types |

The YANG models above are available on the NVIDIA Enterprise Support Portal → Downloads → Switches and Gateways → Switch Software → QM-3 NVOS InfiniBand → More files.

### 8.1.3 gNMI Client Requests

gNMI client on a host can request capabilities and data from the switch. The examples below use the gNMIc client.

The following example shows a gNMIc `STREAM SAMPLE` mode request for specific Interface data, with a sample interval of 30 seconds, suppress redundant flag enabled, and heartbeat interval of 120 seconds:

```
gnmic -a "IP" --port 9339 --skip-verify subscribe --prefix "interfaces"  --path "/interface[name=sw1p1]"  --target
nvos -u admin -p ***** --mode stream --stream-mode sample --sample-interval 30s --suppress-redundant --heartbeat-
interval 120s
```

The following example shows a gNMIc `STREAM ON-CHANGE` mode request for system events, with an updates-only flag enabled:

```
gnmic -a "IP" --port 9339 --skip-verify subscribe --prefix "/system-events"  --path "" --target nvos -u admin -p
***** --mode stream --stream-mode on-change --updates-only
```

The following example shows a gNMIc `ONCE` mode request and server response for IB interface MTU (-d for debug mode):

```
gnmic -a "IP" --port 9339 --skip-verify subscribe --prefix "interfaces"  --path "/interface[name=sw1p1]/infiniband/
state/mtu" -d --target nvos -u admin -p ***** --mode once
{
  "source": "IP",
  "subscription-name": "default-1709707931",
  "timestamp": 1709707925858795109,
  "time": "2024-03-06T08:52:05.858795109+02:00",
  "prefix": "interfaces/interface[name=sw1p1]",
  "target": "nvos",
  "updates": [
    {
      "Path": "infiniband/state/mtu",
      "values": {
        "infiniband/state/mtu": 256
      }
    }
  ]
}
```

The following example shows a gNMIc `ONCE` request for all supported paths:

```
gnmic -a "IP" --port 9339 --skip-verify subscribe --prefix "/"  --path "" --target nvos -u admin -p ***** --mode
once
```

The following example shows a gNMIc `POLL` mode request and server response for FAN1/1 speed:

```
gnmic -a "IP" --port 9339 --skip-verify subscribe --prefix "components"  --path "component[name=FAN1/1]/fan/state/
speed"  --target nvos -u admin -p *****  --format flat --mode poll
components/component[name=FAN1/1]/fan/state/speed: 33
```

The following example shows a gNMIc `STREAM` mode request for specific system-event "text" leaf with `PROTO` encoding:

```
gnmic -a "IP" --port 9339 --skip-verify subscribe --prefix "system-events"  --path "system-event[event-id=38]/
state/text"  --target nvos -u admin -p ***** --encoding proto --format prototext --mode stream

sync_response:  true

update:  {
  timestamp:  1719295967820127958
  prefix:  {
    elem:  {
      name:  "system-events"
    }
    elem:  {
      name:  "system-event"
      key:  {
        key:  "event-id"
        value:  "38"
      }
    }
    target:  "nvos"
  }
  update:  {
    path:  {
      elem:  {
        name:  "state"
      }
      elem:  {
        name:  "text"
      }
    }
    val:  {
      string_val:  "Interface admin state is up"
    }
  }
}
```

A list of supported events can be found in the Event Management page.

The following example shows a gRPC curl command to describe the server using gRPC reflection service:

```
docker run fullstorydev/grpcurl -H username:admin -H password:***** -insecure "IP":9339 describe

gnmi.gNMI is a service:
service gNMI {
  rpc Capabilities ( .gnmi.CapabilityRequest ) returns ( .gnmi.CapabilityResponse );
  rpc Get ( .gnmi.GetRequest ) returns ( .gnmi.GetResponse );
  rpc Set ( .gnmi.SetRequest ) returns ( .gnmi.SetResponse );
  rpc Subscribe ( stream .gnmi.SubscribeRequest ) returns ( stream .gnmi.SubscribeResponse );
}
grpc.reflection.v1.ServerReflection is a service:
service ServerReflection {
  rpc ServerReflectionInfo ( stream .grpc.reflection.v1.ServerReflectionRequest ) returns
( stream .grpc.reflection.v1.ServerReflectionResponse );
}
grpc.reflection.v1alpha.ServerReflection is a service:
service ServerReflection {
  rpc ServerReflectionInfo ( stream .grpc.reflection.v1alpha.ServerReflectionRequest ) returns
( stream .grpc.reflection.v1alpha.ServerReflectionResponse );
}
```

The following example shows a gNMIc `ONCE` mode request for all the supported paths:

```
gnmic -a "IP" --port 9339 --skip-verify subscribe --prefix "/"  --path ""  --target nvos -u admin -p ***** --mode
once --format flat
```

The following example shows a gNMIc `Capabilities` request to retrieve the set of capabilities that is supported by the server:

```
gnmic -a "IP" --port 9339 --skip-verify capabilities -u admin -p *****
```

## 8.1.4 Related Information

- gNMI presentation to IETF
- gNMIc client
- gNMI subscription mode documentation

## 8.1.5 gNMI Streaming Commands

- gNMI Streaming Commands

## 8.1.6 gNMI Streaming Commands


- 8.1.6.1 nv show system gnmi-server
- 8.1.6.2 nv show system gnmi-server mtls
- 8.1.6.3 nv set/unset system gnmi-server state
- 8.1.6.4 nv set sys gnmi-server certificate
- 8.1.6.5 nv set system gnmi-server mtls ca-certificate


### 8.1.6.1 nv show system gnmi-server

| | | |
|---|---|---|
| | nv show system gnmi-server<br>Displays the gNMI server configured state, actual state, and version. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show system gnmi-server
             operational  applied
-----------  -----------  -----------
state        enabled      enabled
certificate  self-signed  self-signed
is-running   yes
version      4.12.0-PS
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/gnmi-server |
| Related Commands | nv set system gnmi-server state disabled |

### 8.1.6.2 nv show system gnmi-server mtls

| | | |
|---|---|---|
| | nv show system gnmi-server mtls<br>Return mTLS state information. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.4002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv show system gnmi-server mtls`<br><br>`  operational  applied`<br>`--------------  -----------  ---------`<br>`ca-certificate  ca_client  ca_client` |
| REST API | GET https://<ip>/nvue_v1/system/gnmi-server/mtls |
| Related Commands | nv show system gnmi-server |
| Notes | |

### 8.1.6.3 nv set/unset system gnmi-server state

| | | |
|---|---|---|
| | nv set system gnmi-server state <enabled \| disabled><br>nv unset system gnmi-server state<br>Sets gNMI server state.<br>The unset form of the command returns the gNMI server state back to its default. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv set system gnmi-server state disabled`<br><br>`admin@nvos:~$ nv unset system gnmi-server state` | |
| REST API | PATCH https://<ip>/nvue_v1/system/gnmi-server<br>DELETE https://<ip>/nvue_v1/system/gnmi-server | |
| Related Commands | nv unset system gnmi-server state | |

### 8.1.6.4 nv set sys gnmi-server certificate

| | | |
|---|---|---|
| | nv set sys gnmi-server certificate {cert id}<br>Set CA certificate for API mTLS connection. | |
| Syntax Description | certificate | Certificate ID string |
| Default | self-signed | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv set sys gnmi-server certificate cert_id` | |
| REST API | PATCH https://<ip>/nvue_v1/system/gnmi-server/certificate?rev= Content-Type: application/json {"certificate": "cert_id"} | |
| Related Commands | | |
| Notes | | |

### 8.1.6.5 nv set system gnmi-server mtls ca-certificate

| | | |
|---|---|---|
| | nv set system gnmi-server mtls ca-certificate <cacert-id><br>gnmi-server security mTLS information | |
| Syntax Description | cacert-id | CA certificates [id] for validation of client during mTLS (string) |
| Default | N/A | |
| History | 25.02.4002 | |
| Example | nv set system gnmi-server mtls ca-certificate ca_client | |
| REST API | PATCH https://<ip>/nvue_v1/system/gnmi-server/mtls/ca-certificate/<arg> | |
| Related Commands | nv show system gnmi-server mtls | |
| Notes | | |

## 8.2 SNMP

Simple Network Management Protocol (SNMP) is a network protocol for management and monitoring of network devices.

NVOS supports:

- SNMP versions v1 and v2c
- Standard MIBs
- Query mode only

### 8.2.1 Standard MIBs

| MIB | Standard |
|---|---|
| RFC1213-MIB | RFC 1213 |
| IF-MIB | RFC 2863 |
| ENTITY-MIB | RFC 2737 |
| ENTITY-SENSOR-MIB | RFC 3433 |

### 8.2.2 Configuring SNMP

Activate the SNMP server on the switch by running:

```
admin@nvos:~$ nv set system snmp-server state enabled
admin@nvos:~$ nv set system snmp-server listening-address <IPv4|IPv6|all|all-v6|localhost|localhost-v6>
admin@nvos:~$ nv set system snmp-server readonly-community <community-string>
admin@nvos:~$ nv set system snmp-server system-contact <contact>
admin@nvos:~$ nv set system snmp-server system-location <location>
```

Community strings are case sensitive.

> Multiple distinct IPv4/IPv6 addresses may be configured as listening addresses, as long as they are present on the system management interface.
>
> Use all/all-v6 to listen on all available management addresses.

## 8.2.3 SNMP Commands

- SNMP Commands

## 8.2.4 SNMP Commands


- 8.2.4.1 nv show system snmp-server
- 8.2.4.2 nv show system snmp-server listening-address
- 8.2.4.3 nv show system snmp-server readonly-community
- 8.2.4.4 nv set system snmp-server state
- 8.2.4.5 nv set system snmp-server listening-address
- 8.2.4.6 nv set system snmp-server readonly-community
- 8.2.4.7 nv set system snmp-server auto-refresh-interval
- 8.2.4.8 nv set system snmp-server system-contact
- 8.2.4.9 nv set system snmp-server system-location


### 8.2.4.1 nv show system snmp-server

| | |
|---|---|
| | nv show system snmp-server<br>Show SNMP server configuration. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |
| Example | |

```
admin@nvos:~$  nv show system snmp-server
                          operational                       applied
pending
---------------------  --------------------------------  --------------------------------
--------------------------------
[listening-address]    all                               all
all
[readonly-community]   efa1f375d76194fa51a3556a97e641e6  efa1f375d76194fa51a3556a97e641e6
efa1f375d76194fa51a3556a97e641e6
auto-refresh-interval  10                                10
10
state                  enabled                           enabled
enabled
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/snmp-server |
| Related Commands | |
| Notes | |

### 8.2.4.2 nv show system snmp-server listening-address

| | | |
|---|---|---|
| | nv show system snmp-server listening-address [addr]<br>Show SNMP server listening addresses configuration. | |
| Syntax Description | addr | Optional, show info of specific address. If omitted, will show a summary of all listening addresses |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | admin@nvos:~$ nv show system snmp-server listening-address<br>port vrf<br>--- ---- ---<br>all 161<br><br>switch (config) # nv show system snmp-server listening-address all<br>operational applied pending<br>---- ---------- ------- -------<br>port 161 161 161 | |
| REST API | GET https://<ip>/nvue_v1/system/snmp-server/listening-address<br>GET https://<ip>/nvue_v1/system/snmp-server/listening-address/{addr} | |
| Related Commands | | |
| Notes | | |

### 8.2.4.3 nv show system snmp-server readonly-community

| | |
|---|---|
| | nv show system snmp-server readonly-community<br>Show SNMP server readonly communities. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |
| Example | admin@nvos:~$ nv show system snmp-server readonly-community<br><br>----------<br>efa1f375d76194fa51a3556a97e641e6 |
| REST API | GET https://<ip>/nvue_v1/system/snmp-server/readonly-community |
| Related Commands | |
| Notes | |

### 8.2.4.4 nv set system snmp-server state

| | |
|---|---|
| | nv set system snmp-server state <enabled \| disabled><br>Enable or disable the SNMP server. |
| Syntax Description | N/A |
| Default | Disabled |

| | |
|---|---|
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv set system snmp-server state enabled` |
| REST API | PATCH https://<ip>/nvue_v1/system/snmp-server |
| Related Commands | |
| Notes | At least 1 listening-address and 1 readonly-community must be configured in order to enabled SNMP server. |

### 8.2.4.5 nv set system snmp-server listening-address

| | | |
|---|---|---|
| | nv set system snmp-server listening-address <addr> [port <port>]<br>Configure a listening-address for the SNMP server. | |
| Syntax Description | addr | The address to set. Both IPv4 and IPv6 are supported.<br>Special addresses may be specified by designated keywords: all (0.0.0.0), localhost (127.0.0.1), all-v6 ([::]), localhost-v6 ([::1]) |
| | port | Optional, set the port for the listening-address. If omitted, will use the default SNMP port 161. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system snmp-server listening-address 1.1.1.1 port 44444` | |
| REST API | PATCH https://<ip>/nvue_v1/system/snmp-server/listening-address/{addr} | |
| Related Commands | | |
| Notes | Multiple listening-addresses may be configured. | |

### 8.2.4.6 nv set system snmp-server readonly-community

| | | |
|---|---|---|
| | nv set system snmp-server readonly-community <community><br>Configure a readonly community for the SNMP server | |
| Syntax Description | community | The community to set |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system snmp-server readonly-community community1` | |
| REST API | PATCH https://<ip>/nvue_v1/system/snmp-server/readonly-community/{community} | |
| Related Commands | | |
| Notes | Up to 4 readonly communities may be configured.<br>The same communities are used for both IPv4 and IPv6. | |

### 8.2.4.7 nv set system snmp-server auto-refresh-interval

| | | |
|---|---|---|
| | nv set system snmp-server auto-refresh-interval {interval}<br>Set the interval in seconds between SNMP data refreshes | |
| Syntax Description | interval | The interval to set, in seconds. The allowed range is [5-300] |
| Default | 60 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system snmp-server auto-refresh-interval 5` | |
| REST API | PATCH https://<ip>/nvue_v1/system/snmp-server | |
| Related Commands | | |
| Notes | In general, SNMP server refreshes its internal data every time period as set by the auto-refresh-interval configuration. However, sysName is an exception. It reflects the system hostname, and is being refreshed on a less frequent basis, every 12 time periods, as the system hostname is not expected to change very often. | |

### 8.2.4.8 nv set system snmp-server system-contact

| | | |
|---|---|---|
| | nv set system snmp-server system-contact <contact><br>Set the value for sysContact in MIB-II. | |
| Syntax Description | contact | The contact to set, up to 255 characters |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system snmp-server system-contact "John Doe"` | |
| REST API | PATCH https://<ip>/nvue_v1/system/snmp-server | |
| Related Commands | | |
| Notes | | |

### 8.2.4.9 nv set system snmp-server system-location

| | | |
|---|---|---|
| | nv set system snmp-server system-location <location><br>Set the value for sysLocation in MIB-II. | |
| Syntax Description | location | The location to set, up to 255 characters |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system snmp-server system-location "2nd floor cabinet"` | |
| REST API | PATCH https://<ip>/nvue_v1/system/snmp-server | |

| | |
|---|---|
| Related Commands | |
| Notes | |

# 9 Monitoring and Diagnostics


- Health Monitoring
- Logging
- Remote Logging
- Link Diagnostic Per Port
- Event Management
- Statistics
- Technical Support
- Troubleshooting


## 9.1 Health Monitoring

NVOS includes a health daemon that is responsible for collecting health events in the system and monitoring various components, including hardware components such as fans, power supply units, leakage sensors, and failing docker containers.

This health daemon runs every 3 seconds, analyzing components. If it detects an issue, it appears in nv show system health and publishes a health event in gNMI.

Health daemon monitors two main items: Service and Hardware

### 9.1.1 Service Monitoring

The health daemon ensures the continuous operation of essential system services. It monitors:

- Critical Dockers and Services: Verifies that all vital dockers and services are running

### 9.1.2 Hardware Monitoring

- Leakage Sensors: Detects any potential fluid leaks
- Temperature Sensors: Monitors the temperature of all hardware components to prevent overheating
- Voltage Sensors: Tracks voltage levels across hardware components to ensure proper functionality
- Fan Speeds: Checks the speed of system fans to maintain optimal airflow and cooling
- Power Supply Units (PSUs): Monitors the status of power supply units for stability
- ASIC Health Status: Verifies the health of ASIC components to prevent processing issues
- Disk: Checks the health and free space of the Disk
- CPU: Monitors the CPU utilization and temperature
- Transievers: Monitors the status of the transievers connected to the system

### 9.1.3 Output Examples

Example output for a healthy system:

```
healthy system
```

```
admin@nvos:~$ nv show system health
            operational  applied
----------  -----------  -------
status      OK
status-led  green


Health issues
================
No Data
```

Example output for a faulty system:

```
bad system
```

```
admin@nvos:~$ nv show system health
            operational  applied
----------  -----------  -------
status      Not OK
status-led  amber


Health issues
================
    Component                      Status information
    -------------------------      ----------------------------------------------------------
    LEAKAGE-2                      detected leakage
    PMIC 1 Temp                    temperature is too hot, temperature=2008.0, threshold=125.0
```

## 9.1.4 Health Monitoring Commands

- Health Monitoring Commands

## 9.1.5 Health Monitoring Commands


- 9.1.5.1 nv show system health
- 9.1.5.2 nv show system health history


### 9.1.5.1 nv show system health

| | | |
|---|---|---|
| | nv show system health<br>Show system health status. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show system health
            operational  applied
----------  -----------  -------
status      Not OK
status-led  off


Health issues
================
    Component  Status information
    ---------  ------------------
    LEAKAGE-1  detected leakage
```

| | |
|---|---|
| Related Commands | nv show system health history |
| Notes | |

### 9.1.5.2 nv show system health history

| | | |
|---|---|---|
| | nv show system health history [file-name]<br>Show system health history file. | |
| Syntax Description | file-name | Show health history files in the system |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show system health history<br><br>admin@nvos:~$ nv show system health history files<br><br>health history reports  File path<br>----------  ----------<br>health_history  /var/log/health_history<br>health_history.1  /var/log/health_history.1<br><br>admin@nvos:~$ nv show system health history files health_history | |
| Related Commands | nv show system health | |
| Notes | • When running the command via the CLI, the file open in “Less”<br>• When no file is selected, the default file name that opens is “health_history” | |

# 9.2 Logging


- 9.2.1 Logging
- 9.2.2 Logging Commands


## 9.2.1 Logging

To display syslog, run the following command:

```
admin@nvos:~$ nv show system log file
```

To display specific syslog file, run the following command:

```
admin@nvos:~$ nv show system log file syslog.1
```

## 9.2.2 Logging Commands


- Logging Commands

## 9.2.3 Logging Commands


- 9.2.3.1 nv show system log
- 9.2.3.2 nv show system log component
- 9.2.3.3 nv show system log rotation
- 9.2.3.4 nv set/unset system log component
- 9.2.3.5 nv set/unset system log rotation disk-percentage
- 9.2.3.6 nv set/unset system log rotation frequency
- 9.2.3.7 nv set/unset system log rotation max-number
- 9.2.3.8 nv set/unset system log rotation size
- 9.2.3.9 nv action rotate system log


### 9.2.3.1 nv show system log

| | | |
|---|---|---|
| | nv show system log {file {file-name} {follow} {list}}<br>Displays the log file | |
| Syntax Description | log | Displays the log file in interactive mode , similar to LINUX “less” utility |
| | file | Displays the contents of the current log |
| | file-name | Displays an archived log file |
| | follow | Displays the last few lines of the current log file and then continues to display new lines as they come in until the user hits Ctrl+C, similar to LINUX “tail” utility. |
| | list | Displays a list of all the available syslog files |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Changed "nv show system log files" to "nv show system log file", removed debug-log option, changed output of "nv show system log" to also display log configurations, added "nv show system log file list" | |
| Example | | |

```
admin@nvos:~$ nv show system log
              operational   applied
------------  ------------  ----------------
[file]        syslog
[file]        syslog.1
[file]        syslog.2.gz
[component]                 nvue
[component]                 orchagent
[component]                 portsyncd
[component]                 sai_api_port
[component]                 sai_api_switch
[component]                 symmetry-manager
[component]                 syncd
rotation
  frequency                 daily
  max-number                20
  size                      10.0


admin@nvos:~$ nv show system log file follow
May 31 15:59:15.041937 nvos INFO pmon#sensord:   PSU-1(L) Temp 3: 36.2 C (min = -0.5 C,
max = 60.0 C)
May 31 16:00:01.312936 nvos INFO core_cleanup.py: Cleaning up core files
May 31 16:00:01.313062 nvos INFO core_cleanup.py: Finished cleaning up core files


admin@nvos:~$ nv show sys log file list

File name     File path
------------  --------------------
syslog        /var/log/syslog
syslog.1      /var/log/syslog.1
syslog.2.gz   /var/log/syslog.2.gz
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/log<br>GET https://<ip>/nvue_v1/system/log/file<br>GET https://<ip>/nvue_v1/system/log/file/{file-name} |
| Related Commands | nv set system log component nvue level <level> |
| Notes | |

## 9.2.3.2 nv show system log component

| | | |
|---|---|---|
| | nv show system log component <component-name> {file {file-name} {follow} {list}}<br>Displays the log configuration of all the system components. | |
| Syntax Description | component-name | Displays the log configuration of specific system component |
| | file | Displays the contents of the current log |
| | file-name | Displays an archived log file |
| | follow | Displays the last few lines of the current log file and then continues to display new lines as they come in until the user hits Ctrl+C, similar to LINUX “tail” utility. |
| | list | Displays a list of all the available syslog files |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |

```
admin@nvos:~# nv show system log component
Component         Level   Summary
----------------  ------  -------
nvue              info
orchagent         notice
portsyncd         notice
sai_api_port      notice
sai_api_switch    notice
symmetry-manager  info
syncd             notice

admin@nvos:~$ nv show system log component nvue file list
File name    File path
-----------  --------------------
nv-cli.log   /var/log/nv-cli.log
nvued.log    /var/log/nvued.log
nvued.log.1  /var/log/nvued.log.1

admin@nvos:~# nv show system log component syncd
       operational  applied
-----  -----------  -------
level  notice       notice
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/log/component<br>GET https://<ip>/nvue_v1/system/log/component/{component-name} |
| Related Commands | nv set system log component nvue level <level> |
| Notes | |

## 9.2.3.3 nv show system log rotation

| | | |
|---|---|---|
| | nv show system log rotation<br>Show log rotation criteria configuration. | |
| Syntax Description | N/A | |
| Default | N/A | |

| | |
|---|---|
| History | 25.02.2002 |
| Example | <br>`admin@nvos:~$ nv show system log rotation`<br>`  operational  applied`<br>`----------  -----------  -------`<br>`frequency  daily  daily`<br>`max-number  20  20`<br>`size  10.0  10.0` |
| REST API | GET https://<ip>/nvue_v1/system/log/rotation |
| Related Commands | nv set system log rotation |
| Notes | |

## 9.2.3.4 nv set/unset system log component

| | | |
|---|---|---|
| | nv set system log component <component-name> level <level><br>nv unset system log component <component-name> level<br>Set/unset the system component minimum priority level of messages to log | |
| Syntax Description | component-name | The system component name: nvue, orchagent, portsyncd, sai_api_port, sai_api_switch, syncd |
| | level | The minimum priority level of messages to log: critical, debug, error, info, notice, warn |
| Default | notice | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~# nv set system log component nvue level debug` | |
| REST API | PATCH https://<ip>/nvue_v1/system/log/component | |
| Related Commands | nv show system log component<br>nv unset system log component level | |
| Notes | To get component-name run "nv show system log component" | |

## 9.2.3.5 nv set/unset system log rotation disk-percentage

| | | |
|---|---|---|
| | nv set system log rotation disk-percentage <percentage><br>nv unset system log rotation disk-percentage<br>Set/unset the size of the log file to rotate based on disk size percentage. | |
| Syntax Description | percentage | Percentage value: 0.001-100 |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv set system log rotation disk-percentage 10`<br>`admin@nvos:~$ nv unset system log rotation disk-percentage` | |
| REST API | PATCH https://<ip>/nvue_v1/system/rotation | |
| Related Commands | nv show system log rotation | |
| Notes | | |

### 9.2.3.6 nv set/unset system log rotation frequency

| | | |
|---|---|---|
| | nv set system log rotation frequency <frequency><br>nv unset system log rotation frequency<br>Set/unset the frequency of the file rotation. | |
| Syntax Description | frequency | Rotation frequency: daily, weekly, monthly, yearly |
| Default | daily | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system log rotation frequency weekly`<br>`admin@nvos:~$ nv unset system log rotation frequency` | |
| REST API | PATCH https://<ip>/nvue_v1/system/rotation | |
| Related Commands | nv show system log rotation | |
| Notes | | |

### 9.2.3.7 nv set/unset system log rotation max-number

| | | |
|---|---|---|
| | nv set system log rotation max-number <count><br>nv unset system log rotation max-number<br>Set/unset the max number of file rotations. | |
| Syntax Description | count | Number of file rotations before being removed: 0-999999 |
| Default | 20 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system log rotation max-number 10`<br>`admin@nvos:~$ nv unset system log rotation max-number` | |
| REST API | PATCH https://<ip>/nvue_v1/system/rotation | |
| Related Commands | nv show system log rotation | |
| Notes | | |

### 9.2.3.8 nv set/unset system log rotation size

| | | |
|---|---|---|
| | nv set system log rotation size <mebibytes><br>nv unset system log rotation size<br>Set the size of the file to be rotated. | |
| Syntax Description | mebibytes | The size threshold for a file to be rotated: 0.001-3500 MiB |
| Default | 10 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system log rotation size 100.123`<br>`admin@nvos:~$ nv unset system log rotation size` | |

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/system/rotation |
| Related Commands | nv show system log rotation |
| Notes | |

### 9.2.3.9 nv action rotate system log

| | | |
|---|---|---|
| | nv action rotate system log<br>Force log file rotation. Action to trigger file rotation manually. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv action rotate system log<br>Performing syslog log file rotation...<br>Log rotated successfully<br>Action succeeded | |
| REST API | POST https://<ip>/nvue_v1/system | |
| Related Commands | nv show system log rotation | |
| Notes | | |

## 9.3 Remote Logging

To configure remote syslog to send syslog messages to a remote syslog server, follow the steps below.

- Set remote syslog server.

```
admin@nvos:~$ nv set system syslog server <IP address/hostname>
```

- (Optional) Set the destination port of the remote host.

```
admin@nvos:~$ nv set system syslog server <IP address/hostname> port <port-id>
```

- (Optional) Define rules for filtering logs:
  - Create a selector

```
admin@nvos:~$ nv set system syslog selector <selector-id>
```

  - Add filtering rules

```
admin@nvos:~$ nv set system syslog selector <selector-id> severity info
```

  - Attach the selector to the server with priority:

```
admin@nvos:~$ nv set system syslog server <IP address/hostname> selector <priority> selector-id
<selector-id>
```

> If multiple selectors are attached to a single syslog server, they are applied using an OR condition. This means a log line may be sent more than once if it matches more than one selector. To prevent this, it is recommended to use a single selector with combined options (such as severity and filters).

- (Optional) Set the protocol over which to communicate with remote syslog server

```
admin@nvos:~$ nv set system syslog server <IP address/hostname> protocol tcp
```

## 9.3.1 Remote Logging Commands

- Remote Logging Commands

## 9.3.2 Remote Logging Commands


- 9.3.2.1 nv show system syslog
- 9.3.2.2 nv show system syslog format
- 9.3.2.3 nv show system syslog server
- 9.3.2.4 nv show system syslog server id
- 9.3.2.5 nv show system syslog selector
- 9.3.2.6 nv show system syslog selector id
- 9.3.2.7 nv show system syslog selector id filter
- 9.3.2.8 nv show system syslog selector id filter id
- 9.3.2.9 nv show system syslog selector id rate-limit
- 9.3.2.10 nv show system syslog server id selector
- 9.3.2.11 nv show system syslog server id selector id
- 9.3.2.12 nv unset system syslog
- 9.3.2.13 nv set/unset system syslog format
- 9.3.2.14 nv set/unset system syslog format welf firewall-name
- 9.3.2.15 nv unset system syslog server
- 9.3.2.16 nv set/unset system syslog server id
- 9.3.2.17 nv set/unset system syslog server id port
- 9.3.2.18 nv set/unset system syslog server id protocol
- 9.3.2.19 nv set/unset system syslog server id vrf
- 9.3.2.20 nv unset system syslog selector
- 9.3.2.21 nv set/unset system syslog selector id
- 9.3.2.22 nv set/unset system syslog selector id severity
- 9.3.2.23 nv set/unset system syslog selector id program-name
- 9.3.2.24 nv set/unset system syslog selector id facility
- 9.3.2.25 nv unset system syslog selector id filter
- 9.3.2.26 nv set system syslog selector id filter id
- 9.3.2.27 nv set system syslog selector id filter id match
- 9.3.2.28 nv set system syslog selector id filter id action
- 9.3.2.29 nv unset system syslog selector id rate-limit

- 9.3.2.30 nv set/unset system syslog selector id rate-limit burst
- 9.3.2.31 nv set/unset system syslog selector id rate-limit interval

## 9.3.2.1 nv show system syslog

| | |
|---|---|
| | nv show system syslog<br>Show syslog configuration.<br>It shows the next information: log format, servers list, trap level. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.5002 Updated output |
| Example | |

```
admin@nvos:~$ nv show system syslog

        operational  applied
------  -----------  --------
format  standard     standard

server
=======
Servers                Vrf      Protocol  Port  Priority  Selector-Id
--------------------   -------  --------  ----  --------  -----------
192.0.0.1              mgmt     tcp       9080
fe80::202:ff:fe00:2e   mgmt     udp       514   10        selector-2
                                           20        selector-3
one.one.one.one        default  tcp       9080  1         selector-3

selector
===========
Selectors   Severity  Program-Name  Facility  Burst  Interval  Filter  Match
Action
----------  --------  ------------  --------  -----  --------  ------  ------------------
-------
selector-1  debug     switchd       daemon    200    5         1       my_important_id.+$
include
selector-2  info      ifreload      user      10     10        2       ^jobsfailed.+$
exclude
selector-3  notice                  daemon    200    5         1       test
exclude
                                                                2       restart

include
$ nv show system syslog
          operational  applied
--------  -----------  -----------
trap      notice       notice
format    standard     standard
[server]  10.20.30.40  10.20.30.40
[server]  mysyslogsrv  mysyslogsrv
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/syslog |
| Related Commands | nv show system log rotation |
| Notes | |

## 9.3.2.2 nv show system syslog format

| | |
|---|---|
| | nv show system syslog format<br>Show syslog format. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv show system syslog format`<br>`  operational  applied`<br>`------  -----------  --------`<br>`format  standard  standard` |
| REST API | GET https://<ip>/nvue_v1/system/syslog/format |
| Related Commands | nv show system log rotation |
| Notes | |

## 9.3.2.3 nv show system syslog server

| | | |
|---|---|---|
| | nv show system syslog server<br>Show remote syslog servers. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002<br>25.02.5002 Updated output | |
| Example | <br>`admin@nvos:~$ nv show system syslog server`<br>`Servers  Vrf  Protocol  Port  Priority  Selector-Id`<br>`-----------  -------  --------  ----  --------  ---------------`<br>`40.90.10.5  default  tcp  9080  10  my-new-selector`<br>`  20  my-selector`<br>`121.0.10.2  default  tcp  514`<br>`121.0.10.12  mgmt  udp  514`<br>`192.0.0.1  red  tcp  9080  10  my-new-selector`<br>`  20  my-selector` | |
| REST API | GET https://<ip>/nvue_v1/system/syslog/server | |
| Related Commands | | |
| Notes | | |

## 9.3.2.4 nv show system syslog server id

| | | |
|---|---|---|
| | nv show system syslog server <server-id><br>Show remote syslog server configuration. | |
| Syntax Description | server-id | Remote syslog server ipv4, or ipv6, or hostname |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output<br>25.02.5002 Updated output | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show system syslog server 40.90.10.5

          operational  applied
--------  -----------  -------
port      9080         9080
protocol  tcp          tcp
vrf       default      default

selector
===========
Priority  Selector-Id
--------  ---------------
10        my-new-selector
20        my-selector
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/syslog/server/{server-id} |
| Related Commands | |
| Notes | |

## 9.3.2.5 nv show system syslog selector

| | | |
|---|---|---|
| | nv show system syslog selector<br>Displays all configured syslog selectors along with severity, filters, and rate-limit data. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.5002 | |
| Example | | |

```
admin@nvos:~$ nv show system syslog selector

Selectors   Severity  Program-Name  Facility  Burst  Interval  Filter  Match
Action
----------  --------  ------------  --------  -----  --------  ------  ------------------
-------
selector-1  debug     switchd       daemon    200    5         1       my_important_id.+$
include
selector-2  info      ifreload      user      10     10        2       ^jobsfailed.+$
exclude
selector-3  notice                  daemon    200    5         1       test
exclude
                                                                2       restart
include
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/syslog/selector |
| Related Commands | |
| Notes | |

## 9.3.2.6 nv show system syslog selector id

| | | |
|---|---|---|
| | nv show system syslog selector <selector-id><br>Shows detailed configuration of a specific selector including severity, facility, and rate limits. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| Default | N/A | |
| History | 25.02.5002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show system syslog selector selector-3

              operational  applied
------------  -----------  -------
facility      daemon       daemon
severity      notice       notice

rate-limit
-----------
burst         200          200
interval      5            5

filter
=======
Priority  Action   Match
--------  -------  -------
1         exclude  test
2         include  restart
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/syslog/selector/{selector-id} |
| Related Commands | |
| Notes | |

## 9.3.2.7 nv show system syslog selector id filter

| | | |
|---|---|---|
| | nv show system syslog selector <selector-id>filter<br>Lists all filter rules under the specified selector, including match patterns and actions. | |
| Syntax Description | <selector-id> | Specifies the unique reference for a syslog selector. |
| Default | N/A | |
| History | 25.02.5002 | |
| Example | | |

```
admin@nvos:~$ nv show system syslog selector selector-3 filter

Priority  Action   Match
--------  -------  -------
1         exclude  test
2         include  restart
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/filter |
| Related Commands | |
| Notes | |

## 9.3.2.8 nv show system syslog selector id filter id

| | | |
|---|---|---|
| | nv show system syslog selector <selector-id> filter <filter-id><br>Displays detailed operational and applied values for a specific filter within the selector. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| Syntax Description | filter-id | Specifies the unique reference for a filter. |
| Default | N/A | |
| History | 25.02.5002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv show system syslog selector selector-3 filter 20`<br><br>`  operational  applied`<br>`------  -----------  -------`<br>`match  test  test`<br>`action  exclude  exclude` |
| REST API | GET https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/filter/{priority-id} |
| Related Commands | |
| Notes | |

## 9.3.2.9 nv show system syslog selector id rate-limit

| | | |
|---|---|---|
| | nv show system syslog selector <selector-id> rate-limit<br>Shows configured burst and interval rate-limit values for the specified selector. | |
| Syntax Description | selector-id | The number of a specific selector |
| Default | N/A | |
| History | 25.02.5002 | |
| Example | <br>`admin@nvos:~$ nv show system syslog selector selector-2 rate-limit`<br><br>`  operational  applied`<br>`--------  -----------  -------`<br>`burst  10  10`<br>`interval  10  10` | |
| REST API | GET https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/rate-limit | |
| Related Commands | | |
| Notes | | |

## 9.3.2.10 nv show system syslog server id selector

| | | |
|---|---|---|
| | nv show system syslog server <server-id> selector<br>Lists all selectors associated with the specified syslog server along with their priorities. | |
| Syntax Description | server-id | Remote syslog server ipv4, or ipv6, or hostname |
| Default | N/A | |
| History | 25.02.5002 | |
| Example | <br>`admin@nvos:~$ nv show system syslog server 40.90.10.5 selector`<br><br>`Priority  Selector-Id`<br>`--------  ---------------`<br>`10  my-new-selector`<br>`20  my-selector` | |
| REST API | GET https://<ip>/nvue_v1/system/syslog/server/{server-id}/selector | |
| Related Commands | | |
| Notes | | |

### 9.3.2.11 nv show system syslog server id selector id

| | | |
|---|---|---|
| | nv show system syslog server <server-id> selector <priority-id><br>Displays detailed information about a selector mapped to the syslog server for the given priority. | |
| Syntax Description | server-id | Remote syslog server ipv4, or ipv6, or hostname |
| | priority-id | Specifies the priority level of a syslog selector |
| Default | N/A | |
| History | 25.02.5002 | |
| Example | | |

```
admin@nvos:~$ nv show system syslog server 40.90.10.5 selector 10

             operational      applied
-----------  ---------------  ---------------
selector-id  my-new-selector  my-new-selector
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/syslog/server/{server-id}/selector/{priority-id} |
| Related Commands | |
| Notes | |

### 9.3.2.12 nv unset system syslog

| | | |
|---|---|---|
| | nv unset system syslog<br>Clear syslog global parameters. It completely removes syslog configuration. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv unset system syslog
```

| | |
|---|---|
| REST API | PATCH https://<ip>/nvue_v1/system/syslog |
| Related Commands | nv show system log rotation |
| Notes | |

### 9.3.2.13 nv set/unset system syslog format

| | | |
|---|---|---|
| | nv set system syslog format<br>nv unset system syslog format<br>Set the log format.<br>The unset form of the command resets format to default value. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002<br>25.02.5002 Removed the welf option | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv unset system syslog format` |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/format |
| Related Commands | nv set system syslog format welf firewall-name |
| Notes | |

### 9.3.2.14 nv set/unset system syslog format welf firewall-name

| | | |
|---|---|---|
| | nv set system format welf firewall-name <name><br>nv unset system format welf firewall-name<br>Set WELF format firewall name.<br>The unset form of that command clears the firewall name. | |
| Syntax Description | Name | Log firewall name to include into WELF log format. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog format welf firewall-name "NVOS switch 2"`<br>`admin@nvos:~$ nv unset system syslog format welf firewall-name` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/format/welf | |
| Related Commands | | |
| Notes | | |

### 9.3.2.15 nv unset system syslog server

| | | |
|---|---|---|
| | nv unset system syslog server<br>Clear remote syslog servers. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv unset system syslog server` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/server | |
| Related Commands | | |
| Notes | | |

### 9.3.2.16 nv set/unset system syslog server id

| | | |
|---|---|---|
| | nv set system syslog server {server-id}<br>nv unset system syslog server {server-id}<br>Set new remote syslog server.<br>The unset form of the command clears a specific server. | |
| Syntax Description | server-id | Remote syslog server ipv4, or ipv6, or hostname |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system syslog server 10.20.30.40<br>admin@nvos:~$ nv unset system syslog server 10.20.30.40 | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/server/{server-id} | |
| Related Commands | | |
| Notes | | |

### 9.3.2.17 nv set/unset system syslog server id port

| | | |
|---|---|---|
| | nv set system server <server-id> port <port-number><br>nv unset system server <server-id> port<br>Set the port over which to communicate with remote syslog server.<br>The unset form of the command returns port to default. | |
| Syntax Description | server-id | Remote syslog server ipv4, or ipv6, or hostname |
| | port-number | Port number of the remote syslog server: 1-65535 |
| Default | 512 | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system syslog server 10.20.30.40 port 1234<br>admin@nvos:~$ nv unset system syslog server 10.20.30.40 port | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/server/{server-id} | |
| Related Commands | | |
| Notes | | |

### 9.3.2.18 nv set/unset system syslog server id protocol

| | | |
|---|---|---|
| | nv set system server <server-id> protocol [tcp \| udp]<br>nv unset system server <server-id> protocol<br>Set the protocol over which to communicate with remote syslog server.<br>The unset form of the command returns the protocol to default. | |
| Syntax Description | server-id | Remote syslog server ipv4, or ipv6, or hostname |
| Default | udp | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv set system syslog server 10.20.30.40 protocol tcp`<br>`admin@nvos:~$ nv unset system syslog server 10.20.30.40 protocol` |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/server/{server-id} |
| Related Commands | |
| Notes | |

### 9.3.2.19 nv set/unset system syslog server id vrf

| | | |
|---|---|---|
| | nv set system server <server-id> vrf [default \| mgmt]<br>nv unset system server <server-id> vrf [default \| mgmt]<br>Specify the VRF over which to communicate with the remote server.<br>The unset form of the command returns VRF to default. | |
| Syntax Description | server-id | Remote syslog server ipv4, or ipv6, or hostname |
| Default | default | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog server 10.20.30.40 vrf mgmt`<br>`admin@nvos:~$ nv unset system syslog server 10.20.30.40 vrf` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/server/{server-id} | |
| Related Commands | | |
| Notes | | |

### 9.3.2.20 nv unset system syslog selector

| | | |
|---|---|---|
| | nv unset system syslog selector<br>Clear remote syslog selectors. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv unset system syslog selector` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector | |
| Related Commands | | |
| Notes | | |

### 9.3.2.21 nv set/unset system syslog selector id

| | | |
|---|---|---|
| | nv set system syslog selector {selector-id}<br>nv unset system syslog server {selector-id}<br>Set new remote syslog selector.<br>The unset form of the command clears a specific selector. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector Selector-1`<br>`admin@nvos:~$ nv unset system syslog selector Selector-2` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id} | |
| Related Commands | | |
| Notes | | |

### 9.3.2.22 nv set/unset system syslog selector id severity

| | | |
|---|---|---|
| | nv set system syslog selector <selector-id> severity <level><br>nv unset system syslog server <selector-id> severity<br>Set the severity level for a specific syslog selector.<br>Unset the severity setting for a specific syslog selector. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| | level | Sets the minimum severity level of logs (debug \| info \| notice \| warn \| error \| critical) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector severity info`<br>`admin@nvos:~$ nv unset system syslog selector severity` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/severity | |
| Related Commands | | |
| Notes | | |

### 9.3.2.23 nv set/unset system syslog selector id program-name

| | | |
|---|---|---|
| | nv set system syslog selector {selector-id} program-name {value}<br>nv unset system syslog server {selector-id} program-name<br>Set the program name filter for a specific syslog selector.<br>Unset the program name filter for a specific syslog selector. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| | value | Application or Program name |

| | |
|---|---|
| Default | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv set system syslog selector program-name switchd`<br>`admin@nvos:~$ nv unset system syslog selector program-name` |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/program-name |
| Related Commands | |
| Notes | |

### 9.3.2.24 nv set/unset system syslog selector id facility

| | | |
|---|---|---|
| | nv set system syslog selector {selector-id} facility {name}<br>nv unset system syslog server {selector-id} facility<br>Set the syslog facility for a specific selector.<br>Unset the facility setting for a specific syslog selector. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| | name | Log source category<br>(auth, authpriv, cron, daemon, kern, lpr, mail, mark, news, security, syslog, user, uucp, local0, local1, local2, local3, local4, local5, local6, local7, null) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector facility daemon`<br>`admin@nvos:~$ nv unset system syslog selector facility` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/program-name | |
| Related Commands | | |
| Notes | | |

### 9.3.2.25 nv unset system syslog selector id filter

| | | |
|---|---|---|
| | nv unset system syslog server {selector-id} filter<br>Unset remote syslog filter. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv unset system syslog selector Selector-2 filter` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/filter | |
| Related Commands | | |

| | |
|---|---|
| Notes | |

### 9.3.2.26 nv set system syslog selector id filter id

| | | |
|---|---|---|
| | nv set system syslog selector {selector-id} filter {filter-id}<br>Set a specific filter for a syslog selector. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| | filter-id | Specifies the unique reference for a filter. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector Selector-1 filter 1`<br>`admin@nvos:~$ nv unset system syslog selector Selector-2 filter 1` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/filter/{filter-id} | |
| Related Commands | | |
| Notes | | |

### 9.3.2.27 nv set system syslog selector id filter id match

| | | |
|---|---|---|
| | nv set system syslog selector {selector-id} filter {filter-id} match {match-string}<br>Set a match string for a specific filter within a syslog selector | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| | filter-id | Specifies the unique reference for a filter. |
| | match-string | Condition to match log messages |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector Selector-1 filter 1 match my_important_id.+$` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/filter/{filter-id}/match | |
| Related Commands | | |
| Notes | | |

### 9.3.2.28 nv set system syslog selector id filter id action

| | | |
|---|---|---|
| | nv set system syslog selector {selector-id} filter {filter-id} action {value}<br><br>Set the action for a specific filter in a syslog selector to either include or exclude matching log entries. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |

| | | |
|---|---|---|
| | filter-id | Specifies the unique reference for a filter. |
| | value | Action to take on matched log messages (include or exclude) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector Selector-1 filter 1 action include` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/filter/{filter-id}/action | |
| Related Commands | | |
| Notes | | |

### 9.3.2.29 nv unset system syslog selector id rate-limit

| | | |
|---|---|---|
| | nv unset system syslog server {selector-id} rate-limit<br>The unset form of the command clears a specific rate-limit. | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector Selector-1 rate-limit` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/rate-limit | |
| Related Commands | | |
| Notes | | |

### 9.3.2.30 nv set/unset system syslog selector id rate-limit burst

| | | |
|---|---|---|
| | nv set system syslog selector {selector-id} rate-limit burst {value}<br>nv unset system syslog server {selector-id} rate-limit burst<br>Sets the burst size for the rate-limiting of syslog messages<br>Unset the rate-limiting burst configuration | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| | value | Maximum number of log messages allowed within the defined interval (1-65535) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector Selector-1 rate-limit burst 1`<br>`admin@nvos:~$ nv unset system syslog selector Selector-2 rate-limit burst` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/rate-limit/burst | |
| Related Commands | | |

| | |
|---|---|
| Notes | |

### 9.3.2.31 nv set/unset system syslog selector id rate-limit interval

| | | |
|---|---|---|
| | nv set system syslog selector {selector-id} rate-limit interval {value}<br>nv unset system syslog server {selector-id} rate-limit interval<br>Sets the time interval for the rate-limiting of syslog messages<br>Unset the rate-limiting interval configuration | |
| Syntax Description | selector-id | Specifies the unique reference for a syslog selector. |
| | value | Time duration (in seconds) during which the burst limit is applied (1-65535) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system syslog selector Selector-1 rate-limit interval 1`<br>`admin@nvos:~$ nv unset system syslog selector Selector-2 rate-limit interval` | |
| REST API | PATCH https://<ip>/nvue_v1/system/syslog/selector/{selector-id}/rate-limit/interval | |
| Related Commands | | |
| Notes | | |

## 9.4 Link Diagnostic Per Port


- 9.4.1 PHY Firmware Indication
  - 9.4.1.1 Link Diagnostic Indication
  - 9.4.1.2 Link Down Reason Indication
- 9.4.2 Link Diagnostic Commands


When debugging a system, it is important to be able to quickly identify the root of a problem. The Diagnostic commands enables an insight into the physical layer components where the user is able to see information such as a cable status (plugged/unplugged) or if Auto-Negotiation has failed.

### 9.4.1 PHY Firmware Indication

#### 9.4.1.1 Link Diagnostic Indication

| Code | Firmware PHY Indication (0-1023) |
|---|---|
| 0 | No issue observed |
| 1 | Port is close by command |
| 2-4 | Auto Negotiation failure |
| 5-8 | Link training failure |
| 9-13 | Logical mismatch between link partners |

| | |
|---|---|
| 14 | Remote fault received |
| 15 | Bad Signal integrity |
| 16 | Compliance code mismatch (protocol mismatch between cable and port) |
| 17 | Bad signal integrity |
| 18 | Internal error |
| 19 | Internal error |
| 22 | Internal error |
| 23 | Internal error |
| 24-32 | Cable compliance code mismatch (protocol mismatch between cable and port) |
| 34 | Speed degradation |
| 35 | Speed degradation |
| 38 | Auto Negotiation failure |
| 39 | Auto Negotiation failure |
| 40 | VPI protocol do not match |
| 41 | Port is closed, module cannot be set to the enabled rate |
| 42 | Bad signal integrity |
| 48 | Bad signal integrity |
| 49 | Bad signal integrity |
| 50 | Internal error |
| 52 | Bad signal integrity |
| 55 | Internal error |
| 56 | module_lanes_frequency_not_synced |
| 57 | Signal not detected |
| 60 | No partner detected for long time |
| 128 | Troubleshooting in process |
| 1023 | Information not available |
| **Code** | **Firmware Management Issues (1024-2047)** |
| 1024 | Cable is unplugged |
| 1025 | Long range for non NVIDIA cable/module |
| 1026 | Bus stuck ($I^2C$ Data or clock shorted) |
| 1027 | Bad/unsupported EEPROM |
| 1028 | Part number list |
| 1029 | Unsupported cable |
| 1030 | Module temperature shutdown |
| 1031 | Shorted cable |
| 1032 | Power budget exceeded |

| | |
|---|---|
| 1033 | Management force down the port |
| 1034 | Module is disabled by command |
| 1035 | System Power is Exceeded therefore the module is powered off |
| 1036 | Module's PMD type is not enabled (see PMTPS). |
| 1040 | pcie system power slot Exceeded |
| 1042 | Module state machine fault |
| 1043-1046 | Module's stamping speed degeneration |
| 1047, 1048 | Modules DataPath FSM fault |
| 1050-1053 | Module Boot Error |
| 1054 | Module Forced to Low Power by command |

#### 9.4.1.2 Link Down Reason Indication

| Code | Link Down Reason Indication |
|---|---|
| 0 | No_link_down_indication |
| 1 | Unknown_reason |
| 2 | Hi_SER_or_Hi_BER |
| 3 | Block_Lock_loss |
| 4 | Alignment_loss |
| 5 | FEC_sync_loss |
| 6 | PLL_lock_loss |
| 7 | FIFO_overflow |
| 8 | false_SKIP_condition |
| 9 | Minor_Error_threshold_exceeded |
| 10 | Physical_layer_retransmission_timeout |
| 11 | Heartbeat_errors |
| 12 | Link_Layer_credit_monitoring_watchdog |
| 13 | Link_Layer_integrity_threshold_exceeded |
| 14 | Link_Layer_buffer_overrun |
| 15 | Down_by_outband_command_with_healthy_link |
| 16 | Down_by_outband_command_for_link_with_hi_ber |
| 17 | Down_by_inband_command_with_healthy_link |
| 18 | Down_by_inband_command_for_link_with_hi_ber |
| 19 | Down_by_verification_GW |
| 20 | Received_Remote_Fault |
| 21 | Received_TS1 |
| 22 | Down_by_management_command |
| 23 | Cable_was_unplugged |

| Code | Link Down Reason Indication |
|---|---|
| 24 | Cable_access_issue |
| 25 | Cable_Thermal_shutdown |
| 26 | Current_issue |
| 27 | Power_budget |
| 28 | Fast_recovery_raw_ber |
| 29 | Fast_recovery_effective_ber |
| 30 | Fast_recovery_symbol_ber |
| 31 | Fast_recovery_credit_watchdog |
| 32 | Peer_side_down_to_sleep_state |
| 33 | Peer_side_down_to_disable_state |
| 34 | Peer_side_down_to_disable_and_port_lock |
| 35 | Peer_side_down_due_to_thermal_event |
| 36 | Peer_side_down_due_to_force_event |
| 37 | Peer_side_down_due_to_reset_event |
| 38 | Reset_no_power_cycle |
| 39 | Fast_recovery_tx_plr_trigger |
| 40 | Down_due_to_HW_force_event |
| 41 | Down_due_to_thermal_event |
| 42 | L1_exit_failure |
| 43 | too_many_link_error_recoveries |
| 44 | Down_due_to_contain_mode |
| 45 | BW_loss_threshold_exceeded |

## 9.4.2 Link Diagnostic Commands

- Link Diagnostic Commands

## 9.4.3 Link Diagnostic Commands


- 9.4.3.1 nv show interface link diagnostics
- 9.4.3.2 nv show interface view link diagnostics
- 9.4.3.3 nv set/unset system lldp
- 9.4.3.4 nv show system lldp
- 9.4.3.5 nv show interface lldp
- 9.4.3.6 nv show interface lldp neighbor
- 9.4.3.7 nv show interface lldp neighbor id
- 9.4.3.8 nv show interface lldp

### 9.4.3.1 nv show interface link diagnostics

| | | |
|---|---|---|
| | nv show interface <interface-id> link diagnostics<br>Display the link diagnostics information of the given interface. | |
| Syntax Description | interface-id | Name of the interface to display |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |
| REST API | GET https://<ip>/nvue_v1/interface/<interface id>/link/diagnostics | |
| Related Commands | nv show interface --view link-diagnostics | |
| Notes | | |

```
admin@nvos:~:~$ nv show interface sw1p1s1 link diagnostics
Code    Status
--------  ------------------------------------------------------
0           No issue was observed
```

### 9.4.3.2 nv show interface view link diagnostics

| | | |
|---|---|---|
| | nv show interface--view link-diagnostics<br>Display the link diagnostics for all the interfaces. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |
| REST API | GET https://<ip>/nvue_v1/interface | |
| Related Commands | nv show interface link diagnostics | |
| Notes | | |

```
admin@nvos:~$ nv show interface --view link-diagnostics
Interface  Code  Status
---------- ----- --------------------
acp1       2     Negotiation failure
acp2       2     Negotiation failure
fnm1       2     Negotiation failure
fnm2       2     Negotiation failure
sw1p1s1    1024  Cable is unplugged
sw1p1s2    1024  Cable is unplugged
```

### 9.4.3.3 nv set/unset system lldp

| | | |
|---|---|---|
| | nv set system lldp [state {enabled,disabled} \| tx-interval {number} \| tx-hold-multiplier {number}]<br>nv unset system lldp [state {enabled,disabled} \| tx-interval {number} \| tx-hold-multiplier {number}]<br>Update LLDP global configurations. | |
| Syntax Description | state | LLDP state configuration. |
| | tx-interval | Change transmit delay. |

| | | |
|---|---|---|
| | tx-hold-multiplier | TTL of transmitted packets is calculated by multiplying the tx-interval by the given factor. |
| Default | state | enabled |
| | tx-interval | 30 |
| | tx-hold-multiplier | 4 |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv set system lldp state disabled<br>admin@nvos:~# nv set system lldp state tx-interval 50 | |
| REST API | PATCH https://<ip>/nvue_v1/system/lldp | |
| Related Commands | nv show system lldp | |
| Notes | | |

### 9.4.3.4 nv show system lldp

| | | |
|---|---|---|
| | nv show system lldp<br>Display LLDP global configurations. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~~$ nv show system lldp<br>operational applied<br>---------- ---------- -------<br>state enabled enabled<br>tx-interval 30 30<br>tx-hold-multiplier 4 4 | |
| REST API | GET https://<ip>/nvue_v1/system/lldp | |
| Related Commands | nv set system lldp | |
| Notes | | |

### 9.4.3.5 nv show interface lldp

| | | |
|---|---|---|
| | nv show interface <interface-id> lldp<br>Show preview details of interface neighbor. | |
| Syntax Description | interface-id | interface name |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$ nv show interface eth0 lldp<br>operational applied<br>---------- ---------- -------<br>[neighbor] MTL-S-F2-LAB-ADVG-SW-4-12 | |
| REST API | | |
| Related Commands | | |
| Notes | | |

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/lldp |
| Related Commands | nv show interface {interface-id} lldp neighbor |
| Notes | This command is just for mgmt interfaces. |

## 9.4.3.6 nv show interface lldp neighbor

| | | |
|---|---|---|
| | nv show interface <interface-id> lldp neighbor<br>Show details of interface neighbor. | |
| Syntax Description | interface-id | interface name |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 lldp neighbor
Neighbor                      Remote IP    Model    SW Version        Remote Port
-------------------------     ----------   -------  ----------------  -----------
MTL-S-F2-LAB-ADVG-SW-4-12     10.60.4.12                              11
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/lldp/neighbor |
| Related Commands | nv show interface <interface-id> lldp neighbor <neighbor-id> |
| Notes | This command is just for mgmt interfaces. |

## 9.4.3.7 nv show interface lldp neighbor id

| | | |
|---|---|---|
| | nv show interface <interface-id> lldp neighbor <neighbor-id><br>Show extend details of the neighbor | |
| Syntax Description | interface-id | Interface name |
| | neighbor-id | Neighbor name |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface eth0 lldp neighbor MTL-S-F2-LAB-ADVG-SW-4-12
                          operational
-------------------------  ----------------------------------------------------
age                        3581
bridge
  untagged                 59
chassis
  chassis-id               1c:98:ec:45:3e:c0
  management-address-ipv4  10.60.4.12
  management-address-ipv6  fdfd:fdfd:7:145::1000:4998
  system-name              MTL-S-F2-LAB-ADVG-SW-4-12
  system-description       HP J9775A 2530-48G Switch, revision YA.16.11.0015, ROM YA.15.
20 ...
port
  ttl                      120
  name                     11
  type                     local
  description              11
  pmd-autoneg
    [advertised]           0
    [advertised]           1
    [advertised]           2
    mau-oper-type          1000BaseTFD - Four-pair Category 5 UTP, full duplex mode

lldp-med
  device-type
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/{interface-id}/lldp/neighbor/{neighbor-id} |

| | |
|---|---|
| Related Commands | nv show interface {interface-id} lldp neighbor |
| Notes | This command is just for mgmt interfaces. |

### 9.4.3.8 nv show interface lldp

| | | |
|---|---|---|
| | nv show interface lldp<br>Show neighbor details of all interfaces. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface lldp
Interface  Speed   Type       Neighbor                    Remote Port
---------  ------  --------   -------------------------   -----------
eth0       1G      eth        MTL-S-F2-LAB-ADVG-SW-4-12   11
ib0                ipoib
lo                 loopback
sw1p1      200G    ib
sw1p2      200G    ib
sw2p1              ib
...  ...
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/interface/lldp |
| Related Commands | nv show interface {interface-id} lldp |
| Notes | |

# 9.5 Event Management


- 9.5.1 Supported Events
- 9.5.2 Clearing Events
  - 9.5.2.1 Receiving Clearing Events
  - 9.5.2.2 Resending Unresolved Issues
  - 9.5.2.3 Backward Compatibility
  - 9.5.2.4 System Reboot
- 9.5.3 Detailed Table of Events
- 9.5.4 Event Management Commands


The primary objective of incorporating this feature is to address particular actions (such as port disable) or events (like port fast-recovery) and broadcast them in a standardized format along with descriptions. This aims to streamline remote system state monitoring for users.

> ⚠ In this current release, only the CLI is supported for accessing the list of broadcasted events. However, in the upcoming release, gNMI will be expanded to facilitate the remote publication of each event to clients. To subscribe to gNMI events, see gNMI Streaming section.

## 9.5.1 Supported Events

The following table presents the supported events with their description.

| Resource | Event Description | Severity |
|---|---|---|
| System | System fatal state detected | CRITICAL |
| System | System is not ready—one or more services are not up | CRITICAL |
| System | System is not ready—one or more services failed | MAJOR |
| System | Restart all syncd-ibv0 dockers | MAJOR |
| System | Performing reboot | MAJOR |
| System | Health status is not ok | WARNING |
| System | System is ready | INFORMATIONAL |
| System | System recovered from fatal state | INFORMATIONAL |
| System | Health status is ok | INFORMATIONAL |
| Sensor or service name | <Repeats a message from the system health> | WARNING |
| Sensor or service name | Hardware component goes back to normal / Service goes back to normal | INFORMATIONAL |
| Interface name | Interface admin state is {Up/Down} | INFORMATIONAL |
| Interface name | Interface operational state is {Up/Down} | INFORMATIONAL |
| Interface name | Fast-recovery error event for trigger {trigger_name} was received | INFORMATIONAL |
| System | System reboot occurred<br>reason: `<reboot cause>`<br>performed by user: `<user who performed reboot>`<br>reboot time: `<time when reboot occurred>`<br>For a list of reboot causes, see Possible Reboot Causes. | INFORMATIONAL |
| ASIC name | PSC detected failure | MAJOR |

## 9.5.2 Clearing Events

### 9.5.2.1 Receiving Clearing Events

For most WARNING/CRITICAL events, the system will send a "Clearing" event once the issue is resolved. If the system experiences two or more issues for a component, it will send an event about the last issue, and once all the issues are resolved, it will send a "Clearing" event for the last issue only. Once you receive a "Clearing" event, all issues for the component are resolved.

Example:

- PSU2 is out of power
- PSU2 is missing or not available
- Cleared: PSU2 is missing or not available

#### 9.5.2.2 Resending Unresolved Issues

If one of the initial issues for the component still exists after the last one was resolved, the system will resend the issue that still exists.

Example:

- PSU2 is out of power
- PSU2 is missing or not available
- PSU2 is out of power

#### 9.5.2.3 Backward Compatibility

Backward compatibility is preserved, and in the case of clearing the issue for the component, the system will also send generic events. Please consider avoiding generic messages, as they will be dropped in future releases.

Example:

- Cleared: PSU2/FAN speed is out of range
- Hardware component goes back to normal

#### 9.5.2.4 System Reboot

After a reboot, the system does not clear any pre-boot events and assumes everything is cleared.

### 9.5.3 Detailed Table of Events

| Event Category | Event Type ID ("event" in gNMI) | Severity | Resource ("component" in gNMI) | Text | Failure Reason | Suggested Repair Flow |
|---|---|---|---|---|---|---|
| **Fan-Related Events** | | | | | | |
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "FAN1/1 speed is out of range, speed=40%, range=[50,100]" | Fan speed out of range | • Collect tech-support and submit NVIDIA support ticket.<br>• Consider number of faulty fans: more than one fan requires immediate maintenance.<br>• Power-cycle the switch.<br>• If persists, submit NVIDIA support ticket to replace fan module. |
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "FAN1/1 is not working" | Fan status is not okay (status in the hardware) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "Failed to get actual speed data for FAN1/1" | Failed to get some information of fan data from hardware | |
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "Failed to get target speed data for FAN1/1" | Failed to get some information of fan data from hardware | |
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "Failed to get speed tolerance for FAN1/1" | Failed to get some information of fan data from hardware | |
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "Failed to get speed status for FAN1/1" | Failed to get some information of fan data from hardware | |
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "FAN1/1 is missing" | Fan is missing | |
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "FAN1/1 direction is not aligned with exhaust direction intake" | Fan direction is not aligned with other fans | |
| Fan failure | HEALTH_NOT_OK | WARNING | FAN1/1 | "Invalid fan speed data for FAN1/1, speed=0x, target=50, tolerance=100" | Invalid speed | |
| Fan health | HEALTH_OK | INFORMATIONAL | FAN1/1 | “HW component goes back to normal” | Fan is back to normal state | N/A |
| **ASIC-Related Events** | | | | | | |
| ASIC failure | HEALTH_NOT_OK | WARNING | ASIC-HEALTH | Switch ASIC in fatal state | ASIC in fatal | • Collect tech-support and submit NVIDIA support ticket.<br>• Reboot the system.<br>• If persists, power-cycle system. |
| ASIC failure | SYSTEM_FATAL_DETECTED | CRITICAL | System | System fatal state detected | Detect ASIC in fatal | |

| | | | | | | |
|---|---|---|---|---|---|---|
| ASIC failure | HEALTH_NOT_OK | WARNING | ASIC1 | ASIC1 temperature is too hot, temperature=120, threshold=105 | ASIC temp too high | • Collect tech-support and submit NVIDIA support ticket.<br>• Continue to monitor switch temperature. |
| ASIC failure | SYSTEM_FATAL_REMEDY | MAJOR | System | Restart all syncd-ibv0 dockers | ASIC in fatal preforming reboot of dockers | N/A |
| ASIC failure | SYSTEM_FATAL_REMEDY | MAJOR | System | Performing reboot | ASIC in fatal preforming reboot | |
| ASIC health | HEALTH_OK | INFORMATIONAL | ASIC1 | “HW component goes back to normal” | ASIC1 is back to normal state | |
| ASIC health | SYSTEM_FATAL_RECOVERED | INFORMATIONAL | System | System recovered from fatal state | Recoverd from fatal | |
| ASIC security irregularity | ASIC_SECURITY_IRREGULARITY | MAJOR | ASIC1 | "PSC detected failure" | The system has detected an irregularity in physical monitoring | N/A |
| **Leakage-Related Events** | | | | | | |
| Leakage | LEAKAGE | CRITICAL | LEAKAGE-1 | Leakage detected, inspect for water leakage and consider power down switch tray | Detected leakage | • Collect tech-support and submit NVIDIA support ticket.<br>• For additional instructions refer to NVONLINE 1115991 chapter "NVIDIA MGX Leak Detection Strategy and Remediation"<br>**NOTE:** Relevant only for liquid-cooled-based systems. |
| Leakage | HEALTH_NOT_OK | WARNING | LEAKAGE-1 | LEAKAGE-1 detected leakage | Detected leakage | |
| **Voltage-Related Events** | | | | | | |
| Voltage | HEALTH_NOT_OK | WARNING | <Voltage-sensor-name> | Sensor voltage is out of range, voltage={}, range=[{},{}] | Voltage sensor not in range | • Collect tech-support and submit NVIDIA support ticket.<br>• Power cycle the switch.<br>• If persists, consider replacing the system. |
| Voltage | HEALTH_NOT_OK | WARNING | <Voltage-sensor-name> | Sensor status is failed | Voltage sensor status in hardware is failed | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Voltage | HEALTH_OK | INFORMATIONAL | <Voltage-sensor-name> | “HW component goes back to normal” | Voltage sensor value is back to normal state | N/A |
| **Temperature-Related Events** | | | | | | |
| Temperature | HEALTH_NOT_OK | WARNING | <Temp-sensor-name> | <Temp-sensor-name> temperature is too hot, temperature={}, threshold={} | Temperature too hot | • Collect tech-support and submit NVIDIA support ticket.<br>• Power cycle the switch.<br>• If persists, see if the sensor is Ambient-MNG-Temp. If it is, check the environmental conditions (CDU and DC temperature).<br>• If persists, consider replacing the system. |
| Temperature | HEALTH_NOT_OK | WARNING | <Temp-sensor-name> | Sensor status is failed | Sensor status in hardware is failed | |
| Temperature | HEALTH_OK | INFORMATIONAL | <Temp-sensor-name> | “HW component goes back to normal” | Temperature sensor value is back to normal state | N/A |
| **System-Services-Related Events** | | | | | | |
| services | HEALTH_NOT_OK | WARNING | <container-name> | Container '<container-name>' is not running | Container is not running | Collect tech-support and submit NVIDIA support ticket. |
| services | HEALTH_OK | INFORMATIONAL | <container-name> | “Service goes back to normal” | Service goes back to normal state | N/A |
| services | CPU_USAGE | WARNING | | CPU usage x% is above expected threshold y% | CPU usage is larger than the expected usage | • Collect techsupport and submit NVIDIA support ticket. |
| services | MEMORY_USAGE | WARNING | | Memory usage x% is above expected threshold y% | Memory usage is larger than the expected usage | • Container will be restarted automatically.<br>• If persists, collect techsupport and submit NVIDIA support ticket. |
| services | CPU_USAGE | INFORMATIONAL | | CPU usage is back to normal | CPU usage is back to normal state | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| services | MEMORY_USAGE | INFORMATIONAL | | Memory usage is back to normal | Memory usage is back to normal state | N/A |
| **System-Initialization-Related Events** | | | | | | |
| Init flow | SYSTEM_STATE_DOWN | CRITICAL | System | System is not ready—one or more services are not up | Some services are not up as part of init | • Collect tech-support and submit NVIDIA support ticket.<br>• If sensor is Ambient-MNG-Temp:<br>• Check environmental conditions (CDU (if exists) and DC temperature).<br>• If persists, power-cycle the switch.<br>• If still persists, replace the switch. |
| Init flow | SYSTEM_STATE_FAILED | MAJOR | System | System is not ready—one or more services failed | Some services failed as part of init | |
| Init flow | SYSTEM_STATE_UP | INFORMATIONAL | System | System is ready | System finished initialization and is ready | N/A |
| **Interface-Related Informational Events** | | | | | | |
| interface | INTERFACE_ADMIN_STATUS | INFORMATIONAL | <interface_name> | "Interface admin state is {admin_state}" | Informs of admin state change of interface | N/A |
| interface | INTERFACE_OPER_STATUS | INFORMATIONAL | <interface_name> | "Interface operational state is {up or down}" | Informs of operational state change of interface | N/A |
| interface | INTERFACE_LOGICAL_STATE | INFORMATIONAL | <interface_name> | "Interface logical state is {logical_state}" | Informs of logical state change of interface | N/A |
| **System-Health-Related Events (The below events are summary and accompany the specific errors that were detailed above)** | | | | | | |
| system | HEALTH_SUMMARY_NOT_OK_CRITICAL | CRITICAL | System | Health status is not ok | Have some health not okay event—critical (e.g. leakage) | Collect tech-support and submit NVIDIA support ticket. |
| system | HEALTH_SUMMARY_NOT_OK | WARNING | System | Health status is not ok | Have some health not okay event—warning | |

| | | | | | | |
|---|---|---|---|---|---|---|
| System | HEALTH_SUMMARY_OK | INFORMATIONAL | System | Health status is ok | System health with no issue | N/A |
| **Transceiver-Related Events** | | | | | | |
| Transceiver failure | HEALTH_NOT_OK | WARNING | sw1 | "Transceiver's temperature is higher than critical threshold [actual = 100, high threshold = 80]" | Temperature is critically high | N/A |
| Transceiver failure | HEALTH_NOT_OK | WARNING | sw1 | "Transceiver's temperature is lower than critical threshold [actual = 1, low threshold = 5]" | Temperature is critically low | N/A |
| Transceiver health | HEALTH_OK | INFORMATIONAL | sw1 | "HW component goes back to normal" | Transceiver's temperature is good now | N/A |

| Event Category | Event Type ID ("event" in gNMI) | Severity | Resource ("component" in gNMI) | Text | Failure Reason | Suggested Repair Flow |
|---|---|---|---|---|---|---|
| **Power-Supply-Unit-Related Events** | | | | | | |
| PSU | HEALTH_NOT_OK | WARNING | <PSU-name> | <PSU-name> is missing—Unpopulated PSU slot | PSU expected to be in the system, but PSU slot is empty | Insert PSU/dummy PSU to the unpopulated PSU slot |
| PSU | HEALTH_NOT_OK | WARNING | <PSU-name> | <PSU-name> is out of power | PSU is out of power | |
| PSU | HEALTH_NOT_OK | WARNING | <PSU-name> | <PSU-name> temperature is too hot, temperature={}, threshold={} | Temperature too hot | |
| PSU | HEALTH_NOT_OK | WARNING | <PSU-name> | <PSU-name> voltage is out of range, voltage={}, range=[{},{}] | Voltage is out of range | |
| PSU | HEALTH_NOT_OK | WARNING | <PSU-name> | <PSU-name> System power exceeds threshold ({}w) | Power exceeds threshold | |

| Event Category | Event Type ID ("event" in gNMI) | Severity | Resource ("component" in gNMI) | Text | Failure Reason | Suggested Repair Flow |
|---|---|---|---|---|---|---|
| PSU | HEALTH_NOT_OK | WARNING | <PSU-name> | <PSU-name> Power supply is not providing power | No power from PSU | |
| PSU | HEALTH_OK | INFORMATIONAL | <PSU-name> | HW component goes back to normal | Health issue was resolved | N/A |

| Event Category | Event Type ID ("event" in gNMI) | Severity | Resource ("component" in gNMI) | Text | Failure Reason | Suggested Repair Flow |
|---|---|---|---|---|---|---|
| **PS-Redundancy-Related Events** | | | | | | |
| Power redundancy policy | HEALTH_NOT_OK | WARNING | N/A | Power redundancy policy no-redundancy requires at least <minimal-number-of-PSUs-per-system> working power supplies, currently system has only <number-of-working-PSUs> | Insufficient number of PSUs relative to the current no-redundancy policy | Insert at least the minimal amount of PSUs required. Minimal PSU amount can be found using the following command:<br>nv show platform ps-redundancy |
| Power redundancy policy | HEALTH_NOT_OK | WARNING | N/A | Power redundancy policy ps-redundant requires at least <minimal-number-of-PSUs-per-system + 1> working power supplies, currently system has only <number-of-working-PSUs> | Insufficient number of PSUs relative to the current ps-redundant policy | Insert at least one more PSU than the minimal amount of PSUs required. Minimal PSU amount can be found using the following command:<br>nv show platform ps-redundancy |
| Power redundancy policy | HEALTH_NOT_OK | WARNING | N/A | Power redundancy policy grid-redundant requires all <number-of-PSUs-in-the-system> power supplies to be working, currently system has only <number-of-working-PSUs> | Insufficient number of PSUs relative to the current grid-redundant policy | Insert PSUs to all PSU slots in the system. |

| Event Category | Event Type ID ("event" in gNMI) | Severity | Resource ("component" in gNMI) | Text | Failure Reason | Suggested Repair Flow |
|---|---|---|---|---|---|---|
| Power redundancy policy | HEALTH_OK | INFORMATIONAL | N/A | HW component goes back to normal | Health issue was resolved | N/A |

## 9.5.4 Event Management Commands

- Event Management Commands

## 9.5.5 Event Management Commands


- 9.5.5.1 nv show system events
- 9.5.5.2 nv show system events --last
- 9.5.5.3 nv show system events --recent
- 9.5.5.4 nv set/unset system events table-size
- 9.5.5.5 nv action clear system events


### 9.5.5.1 nv show system events

| | |
|---|---|
| | nv show system events<br>Display events generated by the system. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.5002 Added Etc/UTC to event timestamp in output |
| Example | |

```
admin@nvos:~$nv show system events

                 operational
---------------  -----------
table-occupancy  80
table-size       1000

Events
=========
    Event ID  Severity       Component  Description
Timestamp
    --------  -------------  ---------
-------------------------------------------------------
-------------------
    80        INFORMATIONAL  System     Health status is ok
2024-04-23 08:29:05 Etc/UTC
    79        INFORMATIONAL  PSU2/FAN   HW component goes back to normal
2024-04-23 08:29:05 Etc/UTC
    78        INFORMATIONAL  PSU1/FAN   HW component goes back to normal
2024-04-23 08:29:05 Etc/UTC
    77        WARNING        PSU1/FAN   PSU1/FAN speed is out of range,
speed=30%, range=[35,100]  2024-04-23 08:29:02 Etc/UTC
    76        WARNING        PSU2/FAN   PSU2/FAN speed is out of range,
speed=30%, range=[35,100]  2024-04-23 08:28:56 Etc/UTC
    75        WARNING        PSU2/FAN   PSU2/FAN speed is out of range,
speed=29%, range=[35,100]  2024-04-23 08:28:50 Etc/UTC
    74        WARNING        PSU1/FAN   PSU1/FAN speed is out of range,
speed=29%, range=[35,100]  2024-04-23 08:28:50 Etc/UTC
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/events |
| Related Commands | nv action clear system events |
| Notes | It shows only the last 50 events in order to not flood the screen with multiple lines at the same time. To get more events, 'last' option can be used. |

## 9.5.5.2 nv show system events --last

| | | |
|---|---|---|
| | `nv show system events --last [number]`<br>Show requested last events. | |
| Syntax Description | number | Requested number of events to show |
| Default | 20 events | |
| History | 25.02.2002<br>25.02.5002 Updated command syntax. JSON no longer has "last" as a key. | |
| Example | | |

```
admin@nvos:~$ nv show system events --last

Event ID  Severity       Component    Description                                          Timestamp
--------  -------------  -----------  ---------------------------------------------
------------------
63529     WARNING        swss-ibv00   Container 'swss-ibv00' is not running                2025-05-1
6 08:05:44
63528     WARNING        syncd-ibv00  Container 'syncd-ibv00' is not running               2025-05-1
6 08:05:41
63527     WARNING        pmon         Container 'pmon' is not running                      2025-05-1
6 08:05:41
63526     INFORMATIONAL  pmon         Service goes back to normal                          2025-05-1
6 08:05:26
63525     INFORMATIONAL  pmon         Cleared: Container 'pmon' is not running             2025-05-1
6 08:05:26
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/events?last/{number} |
| Related commands | nv action clear system events |
| Notes | If no number is specified, this command will show the last 20 entries from the table. |

## 9.5.5.3 nv show system events --recent

| | | |
|---|---|---|
| | `nv show system events --recent [minutes]`<br>Show events in the last requested minutes. | |
| Syntax Description | minutes | Time in past minutes to show events from |
| Default | 5 minutes | |
| History | 25.02.2002<br>25.02.5002 Updated command syntax. JSON no longer has "recent" as a key. | |

| | |
|---|---|
| Example | <br>admin@nvos:~$ nv show system events --recent 10<br><br>Event ID Severity Component Description Timestamp<br>-------- ---------- ---------- ---------- ----------<br>63529 WARNING swss-ibv00 Container 'swss-ibv00' is not running 2025-05-16 08:05:44 |
| REST API | GET https://<ip>/nvue_v1/system/events?recent/{minutes} |
| Related commands | nv action clear system events |
| Notes | If no minutes are specified, this command will display events from the past 5 minutes. |

### 9.5.5.4 nv set/unset system events table-size

| | | |
|---|---|---|
| | nv set/unset system events table-size <number-of-lines><br>Set/unset events table size. | |
| Syntax Description | number-of-lines | Number of lines shown in the events table |
| Default | 1000 lines | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$nv set system events table-size 5000<br>admin@nvos:~$nv unset system events table-size | |
| REST API | PATCH https://<ip>/nvue_v1/system/events/table-size/{number-of-lines} | |
| Related commands | nv show system events | |
| Notes | | |

### 9.5.5.5 nv action clear system events

| | | |
|---|---|---|
| | nv action clear system events<br>Clear events. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | admin@nvos:~$nv action clear system events<br>Action executing ...<br>Event table has been cleared<br>Action succeeded | |
| REST API | POST https://<ip>/nvue_v1/system/events | |
| Related Commands | nv show system events | |
| Notes | | |

## 9.6 Statistics

NVOS collects samples and saves system statistics data. Sampling data is collected for tech-support.

Supporting CLI:

- Show, upload, clear data collected.
- Configure sampling configuration.
    - Enable/disable sampling
    - Sampling interval
    - How long to save samples (cyclic buffer)

Statistics are split into multiple categories:

| Category | Statistic | Description |
|---|---|---|
| Temperature | asic-<x> | Asic temperature (per asic) |
| | ambient COMEX | Ambient comex temperature |
| | Ambient Fan Side | Ambient fan side temperature |
| | Ambient Port Side | Ambient port-side temperature |
| | CPU Core <x> | CPU core temperature (per cpu) |
| | CPU Pack | CPU pack temperature |
| | PSU-<x> | PSU temperature (per PSU) |
| | Module <idx> | Module temperatureerature |
| CPU | Free-ram | Free system ram memory |
| | CPU utilization | CPU utilization over the last 5 minutes (can be either 1/5/15) |
| | Reboot count | Number of reboots |
| Disk | Free space | Free space under "/" |
| | Wear level | Disk remaining time left |
| | Write rate | Average disk write/sec |
| | Read rate | Average disk read/sec |
| | Program fail count | Counts the number of flash program failures |
| | Erase fail count | counts the number of failed data deletion attempts |
| | Uncorrectable error count | count of errors that are impossible to recover |
| Power | Psu-power <x> | PSU power [W] |
| | Psu-current <x> | PSU current [A] |
| Fan | Fan-speed <x> | Fan speed [%] |
| Mgmt-interface | Eth<x> tx bytes | TX bytes diff from last sample |
| | Eth<x> rx bytes | RX bytes diff from last sample |

## 9.6.1 Statistics Commands

- Statistics Commands

## 9.6.2 Statistics Commands


- 9.6.2.1 nv show system stats
- 9.6.2.2 nv show system stats category
- 9.6.2.3 nv show system stats files
- 9.6.2.4 nv set/unset system stats state
- 9.6.2.5 nv set/unset system stats category state
- 9.6.2.6 nv set/unset system stats category interval
- 9.6.2.7 nv set/unset system stats category history-duration
- 9.6.2.8 nv action clear system stats category
- 9.6.2.9 nv action clear system stats category
- 9.6.2.10 nv action generate system stats category
- 9.6.2.11 nv action generate system stats
- 9.6.2.12 nv action clear system stats
- 9.6.2.13 nv action delete system stats files
- 9.6.2.14 nv action upload system stats files


### 9.6.2.1 nv show system stats

| | |
|---|---|
| | nv show system stats<br>Display configuration for system statistics collection reports. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002<br>25.02.3000 Updated command output |
| Example | admin@nvos:~$ nv show system stats<br>operational applied pending<br>---------- ---------- ---------- ----------<br>state enabled enabled enabled<br>[category] cpu cpu<br>[category] disk disk<br>[category] fan fan<br>[category] mgmt-interface mgmt-interface<br>[category] power power<br>[category] temperature temperature<br>[category] voltage voltage |
| REST API | GET https://<ip>/nvue_v1/system/stats |
| Related Commands | nv set/unset system stats state |
| Notes | |

### 9.6.2.2 nv show system stats category

| | |
|---|---|
| | nv show system stats category [<category-id>]<br>Get statistic categories. |

| | | |
|---|---|---|
| Syntax Description | category-id | Display configuration for specified category. |
| Default | N/A | |
| History | 25.02.2002<br>25.02.3000 Updated command output | |
| Example | | |

```
admin@nvos:~$ nv show system stats category
                History Duration (days)  Interval (minutes)  State
--------------  ------------------------  ------------------  -------
cpu             365                       5                   enabled
disk            365                       30                  enabled
fan             365                       5                   enabled
mgmt-interface  365                       5                   enabled
power           365                       5                   enabled
temperature     365                       5                   enabled
voltage         365                       5                   enabled
```

```
admin@nvos:~$ nv show system stats category fan
                 operational  applied
----------------  -----------  -------
state             enabled      enabled
interval          5            5
history-duration  365          365
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/stats/category<br>GET https://<ip>/nvue_v1/system/stats/category/< category-id > |
| Related Commands | nv set/unset system stats category |
| Notes | |

## 9.6.2.3 nv show system stats files

| | | |
|---|---|---|
| | nv show system stats files [<file-name>]<br>Display statistic report files. | |
| Syntax Description | file-name | Display content of specified CSV file. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show  system stats files
Statistic report file                      File path
-----------------------------------------
-----------------------------------------------------
stats_fan_x_20250223_134744.csv  /host/stats/stats_fan_x_20250223_134744.csv
```

```
admin@nvos:~$ nv show  system stats files stats_fan_x_20250223_134744.csv
```

| | |
|---|---|
| REST API | GET https://<ip>/nvue_v1/system/stats/files<br>GET https://<ip>/nvue_v1/system/stats/files/< file-name > |
| Related Commands | nv action generate system stats category |
| Notes | Autocomplete returns also generated tar file (in case if it was generated before), but it can't be displayed, only *.csv files can be displayed |

## 9.6.2.4 nv set/unset system stats state

| | |
|---|---|
| | nv set/unset system stats state [{ enabled \| disabled }]<br>Set/unset state. |

| | | |
|---|---|---|
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system stats state disabled`<br>`admin@nvos:~$ nv unset system stats state` | |
| REST API | PATCH https://<ip>/nvue_v1/system/stats | |
| Related Commands | nv show system stats | |
| Notes | | |

### 9.6.2.5 nv set/unset system stats category state

| | | |
|---|---|---|
| | nv set/unset system stats category <category-id> state [{ enabled \| disabled }]<br>Set/unset category state. | |
| Syntax Description | category-id | Change state for specified category. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system stats category fan state disabled`<br>`admin@nvos:~$ nv unset system stats category fan state` | |
| REST API | PATCH https://<ip>/nvue_v1/system/stats/category/<category-id> | |
| Related Commands | nv show system stats category | |
| Notes | | |

### 9.6.2.6 nv set/unset system stats category interval

| | | |
|---|---|---|
| | nv set/unset system stats category <category-id> interval<br>Set interval in minutes. | |
| Syntax Description | category-id | Change sampling interval for specified category. |
| Default | 5 (30 for disk category) | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system stats category fan interval 60`<br>`admin@nvos:~$ nv unset system stats category fan interval` | |
| REST API | PATCH https://<ip>/nvue_v1/system/stats/category/<category-id> | |

| | |
|---|---|
| Related Commands | nv show system stats category |
| Notes | Sampling interval is in minutes. |

### 9.6.2.7 nv set/unset system stats category history-duration

| | | |
|---|---|---|
| | nv set/unset system stats category <category-id> history-duration[{ 1-365 }]<br>Sampling history duration in days. | |
| Syntax Description | category-id | Change history-duration for specified category. |
| | history-duration | 1-365 days |
| Default | 365 | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set system stats category fan history-duration 31`<br>`admin@nvos:~$ nv unset system stats category fan history-duration` | |
| REST API | PATCH https://<ip>/nvue_v1/system/stats/category/<category-id> | |
| Related Commands | nv show system stats category | |
| Notes | History duration is in days. | |

### 9.6.2.8 nv action clear system stats category

| | | |
|---|---|---|
| | nv action clear system stats category <category-id><br>Clear statistic category sampled data. | |
| Syntax Description | category-id | Category to be cleared. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action clear system stats category fan` | |
| REST API | POST https://<ip>/nvue_v1/system/stats/category/<category-id> | |
| Related Commands | nv action generate system stats category | |
| Notes | | |

### 9.6.2.9 nv action clear system stats category

| | | |
|---|---|---|
| | nv action clear system stats category <category-id><br>Clear statistic category sampled data. | |
| Syntax Description | category-id | Category to be cleared. |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | `admin@nvos:~$ nv action clear system stats category fan` |
| REST API | POST https://<ip>/nvue_v1/system/stats/category/<category-id> |
| Related Commands | nv action generate system stats category |
| Notes | |

### 9.6.2.10 nv action generate system stats category

| | | |
|---|---|---|
| | nv action generate system stats category <category-id><br>Generate statistic report file. | |
| Syntax Description | category-id | Category to be generated CSV file for. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action clear system stats category fan` | |
| REST API | POST https://<ip>/nvue_v1/system/stats/category/<category-id> | |
| Related Commands | nv show system stats files | |
| Notes | | |

### 9.6.2.11 nv action generate system stats

| | | |
|---|---|---|
| | nv action generate system stats<br>Generate tar file with reports from all categories. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action generate system stats` | |
| REST API | POST https://<ip>/nvue_v1/system/stats | |
| Related Commands | nv show system stats files | |
| Notes | | |

### 9.6.2.12 nv action clear system stats

| | | |
|---|---|---|
| | nv action clear system stats<br>Clear statistic sampled data for all categories. | |
| Syntax Description | N/A | |
| Default | N/A | |

| | |
|---|---|
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv action clear system stats` |
| REST API | POST https://<ip>/nvue_v1/system/stat |
| Related Commands | nv action generate system stats |
| Notes | |

## 9.6.2.13 nv action delete system stats files

| | | |
|---|---|---|
| | nv action delete system stats files <file-name><br>Delete available stats report file. | |
| Syntax Description | file-name | Report file to be deleted. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action delete system stats files stats_fan_x_20250223_134744.csv` | |
| REST API | POST https://<ip>/nvue_v1/system/stats/files/<file-name> | |
| Related Commands | nv action generate system stats category<br>nv show system stats files | |
| Notes | | |

## 9.6.2.14 nv action upload system stats files

| | | |
|---|---|---|
| | nv action upload system stats files <file-name> <remote-url><br>Upload available stats report files to remote location. | |
| Syntax Description | file-name | Report file name to be uploaded. |
| | remote-url | Destination image file name<br>Remote url path to upload a file to.<br>Format: [protocol]://username[:password]@hostname/path/filename<br>Supported protocols: SCP, FTP, SFTP, and HTTPS |
| Default | N/A | |
| History | 25.02.2002<br>25.02.4002 Added HTTPS support in remote-url | |
| Example | `admin@nvos:~$ nv action upload system stats files stats_fan_x_20250223_134744.csv scp://user@host/path/to/folder` | |
| REST API | POST https://<ip>/nvue_v1/system/stats/files/<file-name> | |
| Related Commands | nv show system stats files | |
| Notes | | |

# 9.7 Technical Support

NVOS supports generating technical support files to assist with troubleshooting and issue resolution. These files contain critical system logs and diagnostic information that help support teams analyze and address reported issues efficiently.

It is recommended that users generate a technical support file whenever they encounter an issue and include it when filing a support request.

## 9.7.1 How to Generate and Upload a Tech-Support File

For troubleshooting your transceiver, generating and uploading a tech-support file is essential. This file includes detailed diagnostics to aid technical support in resolving your issues.

1. Generate the file.

```
admin@nvos:~$ nv action generate system tech-support
Generating system tech-support file, it might take a few minutes...
Generated tech-support /var/dump/nvos_dump_nvos_20220601_114011.tar.gz
Action succeeded
```

2. Upload generated file to a designated location.

```
admin@nvos:~$ nv action upload system tech-support files nvos_dump_nvos-switch_20230120_151401.tar.gz
scp://username@host-name/home/logs/
Password:
Action executing ...
Upload file nvos_dump_nvos-switch_20230120_151401.tar.gz
Action executing ...
File upload successfully
Action succeeded
```

## 9.7.2 Technical Support Commands

- Technical Support Commands

## 9.7.3 Technical Support Commands


- 9.7.3.1 nv show system tech-support files
- 9.7.3.2 nv action generate system tech-support
- 9.7.3.3 nv action delete system tech-support files
- 9.7.3.4 nv action upload system tech-support files


### 9.7.3.1 nv show system tech-support files

| | | |
|---|---|---|
| | nv show system tech-support files<br>Show the created tech-support files on the switch. | |
| Syntax Description | N/A | |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv show system tech-support files`<br>`File name  Tech-support file path`<br>`----------`<br>`----------`<br>`nvos_dump_nvos-switch_20230120_151401.tar.gz  /host/dump/nvos_dump_nvos-switch_20230120_151401.tar.gz` |
| REST API | GET https://<ip>/nvue_v1/system/tech-support/files |
| Related Commands | nv action generate system tech-support<br>nv action delete system tech-support files |
| Notes | |

## 9.7.3.2 nv action generate system tech-support

| | | |
|---|---|---|
| | nv action generate system tech-support {--since <time>}<br>Action to generate a tech-support file on switch. | |
| Syntax Description | --since | Collect logs and cores only from the given since date |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv action generate system tech-support`<br>`Generating system tech-support file, it might take a few minutes...`<br>`Generated tech-support /var/dump/nvos_dump_jaguar-70_20220601_114011.tar.gz`<br>`Action succeeded`<br><br>`admin@nvos:~$ nv action generate system tech-support --since=1/1/2022`<br>`Generating system tech-support file, it might take a few minutes...`<br>`Generated tech-support /var/dump/nvos_dump_jaguar-70_20220601_114315.tar.gz`<br>`Action succeeded` | |
| REST API | POST https://<ip>/nvue_v1/system/tech-support | |
| Related Commands | nv show system tech-support files<br>nv action delete system tech-support files<br>nv action upload system tech-support files | |
| Notes | | |

## 9.7.3.3 nv action delete system tech-support files

| | | |
|---|---|---|
| | nv action delete system tech-support files <file-name><br>Delete tech-support file from the file system. | |
| Syntax Description | file-name | Name of the tech-support file. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | <br>`admin@nvos:~$ nv action delete system tech-support files nvos_dump_nvos-switch_20230120_151401.tar.gz`<br>`File delete successfully`<br>`Action succeeded` | |
| REST API | POST https://<ip>/nvue_v1/system/tech-support/files/{file-name} | |

| | |
|---|---|
| Related Commands | nv action show system tech-support files<br>nv action generate system tech-support<br>nv action upload system tech-support files |
| Notes | |

### 9.7.3.4 nv action upload system tech-support files

| | | |
|---|---|---|
| | nv action upload system tech-support files <file-name> <remote-url><br>Upload tech-support file to the remote server. | |
| Syntax Description | file-name | Name of the tech-support file. |
| | remote-url | Destination image file name<br>Remote url path to upload a file to.<br>Format: [protocol]://username[:password]@hostname/path/filename<br>Supported protocols: SCP, FTP, SFTP, and HTTPS |
| Default | N/A | |
| History | 25.02.2002<br>25.02.4002 Added HTTPS support in remote-url | |
| Example | admin@nvos:~$ nv action upload system tech-support files nvos_dump_nvos-switch_20230120_151401.tar.gz scp://username@host-name/home/logs/<br>Password:<br>Upload file 1<br>File upload successfully<br>Action succeeded | |
| REST API | POST https://<ip>/nvue_v1/system/tech-support/files/{file-name} | |
| Related Commands | nv action show system tech-support files<br>nv action generate system tech-support<br>nv action delete system tech-support files | |
| Notes | | |

## 9.8 Troubleshooting


- 9.8.1 Resetting NVOS Password
- 9.8.2 Image Upgrade Recovery
- 9.8.3 Management Interface Has No IPv4/6
- 9.8.4 System Fatal Recovery
  - 9.8.4.1 Detecting a Fatal State
  - 9.8.4.2 Automatic Recovery Mechanism
  - 9.8.4.3 Recovery Timeframe


### 9.8.1 Resetting NVOS Password

To reset forgotten password of default user accounts, see Reset Local Users' Passwords section.

## 9.8.2 Image Upgrade Recovery

If the system encounters issues after an image upgrade, the user can switch back to the old partition.

1. Check the current partition.

```
admin@nvos:~$ nv show system image
    operational
---------- ------------------------
current  nvos-25.02.1500
next   nvos-25.02.1500
partition1 nvos-25.02.1500
partition2 nvos-25.02.1400
```

2. Change to the other partition.

```
admin@nvos:~$ nv action boot-next system image partition2
admin@nvos:~$ nv show system image

    operational
---------- ------------------------
current  nvos-25.02.1500
next   nvos-25.02.1400
partition1 nvos-25.02.1500
partition2 nvos-25.02.1400
```

3. Reboot the system.

```
admin@nvos:~$ nv action reboot system
```

## 9.8.3 Management Interface Has No IPv4/6

Check that DHCP is running on the relevant protocol:

```
admin@nvos:~$ nv show interface eth0 ip
                operational                            applied
--------------  -------------------------------------  -------
vrf             default                                default
arp-timeout     1800                                   1800
autoconf        enabled                                enabled
dhcp-client
  state         enabled                                enabled
  set-hostname  enabled                                enabled
  is-running    yes
  has-lease     no
dhcp-client6
  state         enabled                                enabled
  set-hostname  enabled                                enabled
  is-running    yes
  has-lease     yes
[address]       10:10:10:10:10:10:10:10/10
[address]       fdfd:fdfd:7:80:eaeb:d3ff:fe4b:70b8/64
[gateway]
```

If the interface does not have a lease, run the following action to renew the DHCP lease:

```
admin@nvos:~$ nv action renew interface eth0 ip dhcp-client
Action executing ...
Renewing DHCP lease for eth0, connection may be interrupted
Action executing ...
DHCP lease for eth0 was renewed
Action succeeded
```

## 9.8.4 System Fatal Recovery

The system has mechanism to detect if ASIC encountered health/firmware burn issue and try to recover from it.

During the fatal detection and recovery, events will be raised as well. For more information, see ASIC-Related Events in the Event Managment section.

### 9.8.4.1 Detecting a Fatal State

The system's fatal state is indicated in the CLI prompt and in the nv show system health command. Example:

```
[System_Fatal_State]admin@nvos~$ nv show system health
           operational  applied
----------  -----------  -------
status      FATAL
status-led  amber


Health issues
================
    Component    Status information
    -----------  --------------------------
    ASIC-HEALTH  Switch ASIC in fatal state.
```

### 9.8.4.2 Automatic Recovery Mechanism

The system has an internal mechanism to recover from a fatal state without user intervention. The recovery process involves the following steps:

1. Restart the ASICs of the system.
2. If restarting the ASICs does not resolve the issue, the system will attempt to recover through a system reboot.
   If after the reboot system still encounters ASIC issues, another reboot will be performed.
3. After the second reboot, the system will start without configuring the ASICs, leaving all ports down. NVOS is running, so logs can be collected for analysis.
4. To try to revive the switch, perform a system reboot by running nv action reboot system.
5. If system entered fatal state again, please contact NVIDIA's support team.

> ⚠ Any reboot initiated by the user will also reset the system's fatal detection and recovery mechanism. This process starts the recovery steps from the beginning.

### 9.8.4.3 Recovery Timeframe

- After the recovery steps are completed and the system remains operational for 10 minutes without any health issues, it will exit the fatal state.
- During this 10-minute observation period, the system may still appear in a fatal state as reflected in the CLI prompt and system health command.
- Once the system exits the fatal state, the CLI prompt and system health command will confirm the recovery.

# 10 InfiniBand Switching

The following pages provide information on configuring InfiniBand protocols and features.

- InfiniBand Interface
- IPoIB
- ibdiagnet
- Fabric

## 10.1 InfiniBand Interface

### 10.1.1 Transceiver Information

NVOS offers the option of viewing the transceiver information of a module or cable connected to a specific interface. The information is a set of read-only parameters burned onto the EEPROM of the transceiver by the manufacturer. The parameters include identifier (connector type), cable type, and additional inventory attributes. For optical transceivers, there are also diagnostic parameters such as temperature, voltage, and information about channels.

#### 10.1.1.1 Configure Connection-Mode In an InfiniBand Interface

The connection-mode attribute indicates to which peer this port is connected. This feature is dedicated to Q3200-RA system which can be connected to NDR systems (or older) and to XDR systems.
In case the port is connected to XDR systems, the connection-mode should be XDR. If it connected to NDR system, the connection-mode should be NDR. By default, all the ports are configured to connection-mode XDR.
When connecting port to NDR system, the port connection-mode needs to be changed with the set command (nv set interface link connection-mode) to 'ndr' in order to have link up with full bandwidth. Changing port connection-mode will move the port to down and up again when configuration ends.

### 10.1.2 InfiniBand Interface Commands

- InfiniBand Interface Commands

### 10.1.3 InfiniBand Interface Commands


- 10.1.3.1 nv show interface infiniband
- 10.1.3.2 nv show interface link
- 10.1.3.3 nv set interface link state
- 10.1.3.4 nv set interface link mtu
- 10.1.3.5 nv set interface link op-vls
- 10.1.3.6 nv set interface link lanes

- 10.1.3.7 nv set interface link ib-speed
- 10.1.3.8 nv set interface link auto-negotiate
- 10.1.3.9 nv set interface description
- 10.1.3.10 nv action clear interface link counters
- 10.1.3.11 nv action clear interface counters


## 10.1.3.1 nv show interface infiniband

| | | |
|---|---|---|
| | nv show interface <interface-id><br>Displays details of a single InfiniBand interface. | |
| Syntax Description | interface-id | Name of the InfiniBand interface to display |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface sw9p1
                      operational           applied
--------------------  --------------------  --------
link
  auto-negotiate      on                    on
  duplex                                    full
  speed                                     auto
  counters
    in-bytes          0 Bytes
    in-pkts           0
    in-drops          0
    in-errors         0
    out-bytes         0 Bytes
    out-pkts          0
    out-drops         0
    out-errors        0
    in-symbol-errors  0
    out-wait          0
  [diagnostics]
  mtu                                       4096
  op-vls                                    VL0-VL7
  lanes                                     1X,2X,4X
  ib-speed                                  auto
  state               down                  up
  supported-ib-speed  sdr,fdr,edr,hdr,ndr
  max-supported-mtu   4096
  physical-state      Polling
  logical-state       Down
  supported-lanes     1X,2X,4X
  vl-capabilities     VL0-VL7
  ib-subnet           infiniband-default
  round-trip-latency  248 ns
type                  ib                    ib
```

| | |
|---|---|
| REST API | GET https://<id>/nvue_v1/interface/{interface-id} |
| Related Commands | set interface<br>show interface management |
| Notes | The data presented here is for an InfiniBand interface. If the id of a different type of interface is provided, the output will be different. |

## 10.1.3.2 nv show interface link

| | | |
|---|---|---|
| | nv show interface <interface-id> link {state \| counters \| phy-diag \| phy-detail}<br>Displays link information of a single InfiniBand interface. | |
| Syntax Description | interface-id | Name of the InfiniBand interface to display. |
| | state | Show only the data relating to state. |
| | counters | Show only the data relating to counters. |

| | | |
|---|---|---|
| | phy-diag | Show PHY diagnostics and FSM states, part of AMBER |
| | phy-detail | Show PHY statistics and BER measurements, part of AMBER |
| Default | N/A | |
| History | 25.02.2002 | |

Example

```
admin@nvos:~$ nv show interface sw23p2 link
                    operational           applied
------------------  --------------------  --------
auto-negotiate      on                    on
duplex                                    full
speed               400G                  auto
counters
  in-bytes          5.06 KB
  in-pkts           18
  in-drops          0
  in-errors         0
  out-bytes         5.06 KB
  out-pkts          18
  out-drops         0
  out-errors        0
  in-symbol-errors  0
  out-wait          0
[diagnostics]
mtu                 4096                  4096
op-vls              VL0-VL3               VL0-VL7
lanes               4X                    1X,2X,4X
ib-speed            ndr                   auto
state               up                    up
supported-ib-speed  sdr,fdr,edr,hdr,ndr
max-supported-mtu   4096
physical-state      LinkUp
logical-state       Active
supported-lanes     1X,2X,4X
vl-capabilities     VL0-VL7
ib-subnet           infiniband-default
round-trip-latency  312 ns
```

```
admin@nvos:~$ nv show interface sw23p2 link state
operational  applied
-----------  -------
up           up

admin@nvos:~$ nv show interface sw1p1 link counters
                 operational
----------------  -----------
in-bytes          0 B
in-drops          0
in-errors         0
in-pkts           0
out-bytes         0 B
out-drops         0
out-errors        0
out-pkts          0
in-symbol-errors  0
out-wait          0
```

```
admin@nvos:~$ nv show interface sw1p1 link phy-diag
                                        operational
--------------------------------------  -----------
pd-fsm-state                            0
eth-an-fsm-state                        0
phy-hst-fsm-state                       LINKUP
psi-fsm-state                           IDLE
phy-manager-link-width-enabled          256
phy-manager-link-proto-enabled          1:20000
core-to-phy-link-width-enabled          256
core-to-phy-link-proto-enabled          1:800000
cable-proto-cap-ext                     1:0
loopback-mode                           NONE
retran-mode-request                     0
retran-mode-active                      0
fec-mode-request                        2048
profile-fec-in-use                      255
phy-manager-state                       ACTIVE
sync-header-error-counter               0
port-local-physical-errors              0
port-malformed-packet-errors            0
port-buffer-overrun-errors              0
port-dlid-mapping-errors                0
port-vl-mapping-errors                  0
port-looping-errors                     0
port-inactive-discards                  0
port-neighbor-mtu-discards              0
plr-rcv-codes                           73634260371
plr-rcv-codes-err                       0
plr-rcv-uncorrectable-code              0
plr-xmit-codes                          73634123139
plr-xmit-retry-codes                    0
plr-xmit-retry-events                   0
plr-sync-events                         0
plr-codes-loss                          0
plr-xmit-retry-events-within-t-sec-max  0
plr-bw-loss-percent                     0.0
rq-general-error                        0
ib-phy-fsm-state                        DISABLED
zero-hist                               5
successful-recovery-events              0
```

```
admin@nvos:~$ nv show interface sw1p1 link phy-detail
                                operational
------------------------        ---------------
time-since-last-clear-min       1945856
phy-received-bits               778342400000000
symbol-errors                   0
effective-errors                0
phy-raw-errors-lane0            1906686
phy-raw-errors-lane1            1659554
phy-raw-errors-lane2            0
phy-raw-errors-lane3            0
phy-raw-errors-lane4            0
phy-raw-errors-lane5            0
phy-raw-errors-lane6            0
phy-raw-errors-lane7            0
raw-ber                         4E-9
symbol-ber                      15E-255
effective-ber                   15E-255
raw-ber-lane0                   4E-9
raw-ber-lane1                   4E-9
raw-ber-lane2                   0E-0
raw-ber-lane3                   0E-0
raw-ber-lane4                   0E-0
raw-ber-lane5                   0E-0
raw-ber-lane6                   0E-0
raw-ber-lane7                   0E-0
rs-num-corr-err-bin0            151471657460
rs-num-corr-err-bin1            1690966
rs-num-corr-err-bin2            937603
rs-num-corr-err-bin3            16
rs-num-corr-err-bin4            5
rs-num-corr-err-bin5            0
rs-num-corr-err-bin6            0
rs-num-corr-err-bin7            0
rs-num-corr-err-bin8            0
rs-num-corr-err-bin9            0
rs-num-corr-err-bin10           0
rs-num-corr-err-bin11           0
rs-num-corr-err-bin12           0
rs-num-corr-err-bin13           0
rs-num-corr-err-bin14           0
rs-num-corr-err-bin15           0
```

| | |
|---|---|
| REST API | GET https://<id>/nvue_v1/interface/{interface-id}/link<br>GET https://<id>/nvue_v1/interface/{interface-id}/link/counters<br>GET https://<id>/nvue_v1/interface/{interface-id}/link/state<br>GET https://<ip>/nvue_v1/interface/{interface-id}/link/phy-diag<br>GET https://<ip>/nvue_v1/interface/{interface-id}/link/phy-detail |
| Related Commands | set interface link |
| Notes | |

### 10.1.3.3 nv set interface link state

| | | |
|---|---|---|
| | nv set interface <interface-id> link state {value}<br>nv unset interface <interface-id> link state {value}<br>Sets the administrative link state of a given InfiniBand interface.<br>The unset sets the administrative link state of a given InfiniBand interface to the default value of "up". | |
| Syntax Description | interface-id | Name of the interface whose link state to set. |
| | Value | New value for the link state: {up, down} |
| Default | up | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set interface sw9p1 link state down
admin@nvos:~$ nv unset interface sw9p1 link state
```

| | |
|---|---|
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/link/state |
| Related Commands | show interface<br>nv unset interface link |

| | |
|---|---|
| Notes | |

### 10.1.3.4 nv set interface link mtu

| | | |
|---|---|---|
| | nv set interface <interface-id> link mtu {value}<br>nv unset interface <interface-id> link mtu<br>Sets the mtu of a given InfiniBand interface.<br>The unset form of the command sets the link mtu of a given InfiniBand interface to the default value of 4096. | |
| Syntax Description | interface-id | Name of the interface whose link mtu to set |
| | value | New value for the MTU: 256, 512 ,1024, 2048, 4096 |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set interface sw1p1 link mtu 512
admin@nvos:~$ nv unet interface sw1p1 link mtu
```

| | |
|---|---|
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/link |
| Related Commands | set interface link<br>show interface infiniband |
| Notes | |

### 10.1.3.5 nv set interface link op-vls

| | | |
|---|---|---|
| | nv set interface <interface-id> link op-vls {value}<br>nv unset interface <interface-id> link op-vls<br>Sets the op-vls of a given InfiniBand interface.<br>The unset for of the command sets the link op-vls of a given InfiniBand interface to the default value of VL0-VL7. | |
| Syntax Description | interface-id | Name of the interface whose link op-vls to set |
| | value | New value for the op-vls: VL0, VL0-VL1, VL0-VL3, VL0-VL7 |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set interface sw1p1 link op-vls VL0-VL3
admin@nvos:~$ nv unet interface sw1p1 link op-vls
```

| | |
|---|---|
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/link |
| Related Commands | set interface link<br>show interface infiniband |
| Notes | |

### 10.1.3.6 nv set interface link lanes

| | | |
|---|---|---|
| | nv set interface <interface-id> link lanes {value}<br>nv unset interface <interface-id> link lanes<br>Sets the lanes of a given InfiniBand interface.<br>The unset form of the command sets the link lanes of a given InfiniBand interface to the default value of 1X,4X. | |
| Syntax Description | interface-id | Name of the interface whose link lanes to set |
| | value | New value for the lanes:<br>• 1X<br>• 1X,2X<br>• 1X,4X<br>• 1X,2X,4X |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set interface sw1p1 link lanes 1X,4X
admin@nvos:~$ nv unet interface sw1p1 link lanes
```

| | |
|---|---|
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/link |
| Related Commands | set interface link<br>show interface infiniband |
| Notes | |

### 10.1.3.7 nv set interface link ib-speed

| | | |
|---|---|---|
| | nv set interface <interface-id> link ib-speed {value}<br>nv unset interface <interface-id> link ib-speed<br>Sets the ib-speed of a given InfiniBand interface.<br>The unset form of the command sets the link ib-speed of a given InfiniBand interface to the max supported ib-speed. | |
| Syntax Description | interface-id | Name of the interface whose link ib-speed to set. |
| | value | New value for the ib-speed:<br>• sdr—10.0Gb/s rate on 4 lane width<br>• qdr—40.0Gb/s rate on 4 lane width<br>• fdr—56.0Gb/s rate on 4 lane width<br>• edr—100.0Gb/s rate on 4 lane width<br>• hdr—200.0 Gb/s rate on 4 lane width<br>• ndr—400.0 Gb/s rate on 4 lane width<br>• auto—The max supported speed of the interface |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set interface sw1p1 link ib-speed hdr
admin@nvos:~$ nv unset interface sw1p1 link ib-speed
```

| | |
|---|---|
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/link |

| | |
|---|---|
| Related Commands | set interface link<br>show interface infiniband |
| Notes | |

### 10.1.3.8 nv set interface link auto-negotiate

| | | |
|---|---|---|
| | nv set interface <interface-id> link auto-negotiate {value}<br>nv unset interface <interface-id> link auto-negotiate<br>Sets the auto-negotiate of a given InfiniBand interface.<br>The unset form of the command sets the link auto-negotiate of a given InfiniBand interface to the default value which is on. | |
| Syntax Description | interface-id | Name of the interface whose link auto-negotiate to set. |
| | value | New value for the auto-negotiate: {on, off} |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface sw1p1 link auto-negotiate on`<br>`admin@nvos:~$ nv unet interface sw1p1 link auto-negotiate` | |
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/link | |
| Related Commands | set interface link<br>show interface infiniband | |
| Notes | | |

### 10.1.3.9 nv set interface description

| | | |
|---|---|---|
| | nv set interface <interface-id> description {value}<br>nv unset interface <interface-id> description {value}<br>Sets the description of a given InfiniBand interface.<br>The unset sets the description of a given InfiniBand interface to empty. | |
| Syntax Description | interface-id | Name of the interface whose description to set. |
| | Value | New value for the description. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface sw9p1 description "sw9p1 description"`<br>`admin@nvos:~$ nv unset interface sw9p1 description`<br><br>`admin@nvos:~$ nv unset interface sw1p1`<br>`admin@nvos:~$ nv unset interface` | |
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id} | |
| Related Commands | nv show interface | |

| | |
|---|---|
| Notes | |

### 10.1.3.10 nv action clear interface link counters

| | | |
|---|---|---|
| | nv action clear interface <interface-id> link counters<br>Clears the interface counters for the user running the command. | |
| Syntax Description | interface-id | Name of the interface whose link stats to clear. or range of interfaces (e.g. sw1-2p1-2 → sw1p1,sw1p2,sw2p1,sw2p2) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv action clear interface sw1p1 link counters` | |
| REST API | POST https://<id>/nvue_v1/interface/{interface-id}/link/counters | |
| Related Commands | nv show interface <id> link counters | |
| Notes | | |

### 10.1.3.11 nv action clear interface counters

| | |
|---|---|
| | nv action clear interface counters<br>Clears all InfiniBand interfaces counters for the user running the command. |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv action clear interface counters` |
| REST API | POST https://<id>/nvue_v1/interface |
| Related Commands | |
| Notes | |

# 10.2 IPoIB

## 10.2.1 IPoIB Commands

- IPoIB Commands

## 10.2.2 IPoIB Commands

- 10.2.2.1 nv show interface ib0
- 10.2.2.2 nv show interface link
- 10.2.2.3 nv show interface ip
- 10.2.2.4 nv set interface link state
- 10.2.2.5 nv set/unset interface description
- 10.2.2.6 nv set/unset interface ip
- 10.2.2.7 nv unset interface
- 10.2.2.8 nv unset interface link


## 10.2.2.1 nv show interface ib0

| | | |
|---|---|---|
| | nv show interface {interface-id}<br>Displays details of an IPoIB interface. | |
| Syntax description | interface-id | Name of the IPoIB interface to display (e.g., ib0) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface ib0
                        operational                                                  applied
----------------------  ------------------------------------------------------------ --------
ip
  arp-timeout           1800                                                         1800
  autoconf              disabled                                                     disabled
  dhcp-client
    state               disabled                                                     disabled
    set-hostname        enabled                                                      enabled
    is-running          no
    has-lease           no
  dhcp-client6
    state               disabled                                                     disabled
    set-hostname        enabled                                                      enabled
    is-running          no
    has-lease           no
  [gateway]
link
  auto-negotiate                                                                     on
  duplex                                                                             full
  speed                                                                              auto
  mac                   80:00:00:02:fe:80:00:00:00:00:00:00:90:0a:84:03:00:76:a8:00
  counters
    in-bytes            72 Bytes
    in-pkts             1
    in-drops            0
    in-errors           0
    out-bytes           480 Bytes
    out-pkts            4
    out-drops           0
    out-errors          0
    carrier-transitions 2
  mtu                   2044                                                         2044
  state                 up                                                           up
ifindex                 8
type                    ipoib                                                        ipoib
```

| | |
|---|---|
| REST API | GET https://<id>/nvue_v1/interface/{interface-id} |
| Related commands | nv show interface<br>nv set interface<br>nv unset interface |
| Notes | |

## 10.2.2.2 nv show interface link

| | |
|---|---|
| | nv show interface {interface-id} link {state \| counters}<br>Displays link information of an IPoIB interface. |

| | | |
|---|---|---|
| Syntax description | interface-id | Name of the interface to display (e.g., ib0). |
| | state | Show only the data relating to state. |
| | stats | Show only the data relating to statistics. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv show interface ib0 link state
operational  applied  pending
-----------  -------  -------
down         up       up
```

```
admin@nvos:~$ nv show interface ib0 link counters
                    operational
------------------  -----------
in-bytes            0 Bytes
in-pkts             0
in-drops            0
in-errors           0
out-bytes           0 Bytes
out-pkts            0
out-drops           0
out-errors          0
carrier-transitions 1
```

| | |
|---|---|
| REST API | GET https://<id>/nvue_v1/interface/{interface-id}/link<br>GET https://<id>/nvue_v1/interface/{interface-id}/link/state<br>GET https://<id>/nvue_v1/interface/{interface-id}/link/counters |
| Related commands | nv show interface<br>nv set interface link<br>nv unset interface link |
| Notes | |

## 10.2.2.3 nv show interface ip

| | | |
|---|---|---|
| | nv show interface {interface-id} ip {address}<br>Displays IP address of an IPoIB interface. | |
| Syntax description | interface-id | Name of the interface to display (e.g., ib0) |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | |

```
admin@nvos:~$ nv show interface ib0 ip
                operational  applied      pending
--------------  -----------  -----------  -----------
arp-timeout     1800         1800         1800
autoconf        disabled     disabled     disabled
dhcp-client
  state         disabled     disabled     disabled
  set-hostname  enabled      enabled      enabled
  is-running    no
  has-lease     no
dhcp-client6
  state         disabled     disabled     disabled
  set-hostname  enabled      enabled      enabled
  is-running    no
  has-lease     no
[address]       2.2.2.11/24  2.2.2.11/24  2.2.2.11/24
[gateway]


admin@nvos:~$ nv show interface ib0 ip address

-----------
2.2.2.11/24
```

| | |
|---|---|
| REST API | GET https://<id>/nvue_v1/interface/{interface-id}/ip<br>GET https://<id>/nvue_v1/interface/{interface-id}/ip/address |
| Related commands | nv show interface<br>nv set interface ip<br>nv unset interface ip |
| Notes | |

## 10.2.2.4 nv set interface link state

| | | |
|---|---|---|
| | nv set interface {interface-id} link state {value}<br>Sets the administrative link state of a given IPoIB interface. | |
| Syntax description | interface-id | Name of the interface whose link state to set (e.g., ib0) |
| | value | New value for the link state: {up, down} |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | | |

```
admin@nvos:~$ nv set interface ib0 link state up
```

| | |
|---|---|
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/link/state |
| Related commands | nv show interface<br>nv unset interface {interface-id} link state |
| Notes | |

## 10.2.2.5 nv set/unset interface description

| | | |
|---|---|---|
| | nv set interface {interface-id} description<br>nv unset interface {interface-id} description<br>Sets the description of a given IPoIB interface.<br>The unset formof the command sets the description of a given IPoIB interface to empty. | |
| Syntax description | interface-id | Name of the interface whose link state to set (e.g., ib0) |
| | value | New value for the description. |

| | |
|---|---|
| Default | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv set interface ib0 description "IPoIB interface"`<br>`admin@nvos:~$ nv unset interface ib0 description` |
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id} |
| Related commands | nv show interface<br>nvunset interface description |
| Notes | |

## 10.2.2.6 nv set/unset interface ip

| | | |
|---|---|---|
| | nv set interface {interface-id} ip address<br>nv unset interface {interface-id} ip {address {}}<br>Sets the IP address of a given IPoIB interface.<br>The unset form of the command deletes one or more IP addresses assigned to a given IPoIB interface. | |
| Syntax description | interface-id | Name of the interface whose IP address to set (e.g., ib0) |
| | ip-prefix-id | IP address and netmask to assign to the interface. |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv set interface ib0 ip address 10.10.1.1/8`<br>`admin@nvos:~$ nv unset interface ib0 ip address 10.10.1.1/8`<br>`admin@nvos:~$ nv unset interface ib0 ip address`<br>`admin@nvos:~$ nv unset interface ib0 ip` | |
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/ip/address | |
| Related commands | nv show interface | |
| Notes | | |

## 10.2.2.7 nv unset interface

| | | |
|---|---|---|
| | nv unset interface {interface-id}<br>Sets all attributes of an IPoIB interface to default values. | |
| Syntax description | interface-id | Name of the interface to set to default values (e.g., ib0) |
| Default | N/A | |

| | |
|---|---|
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv unset interface ib0` |
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id} |
| Related commands | nv show interface<br>nv set interface |
| Notes | |

### 10.2.2.8 nv unset interface link

| | | |
|---|---|---|
| | nv unset interface {interface-id} link {state}<br>Sets the administrative link state of a given IPoIB interface to the default value of "up". | |
| Syntax description | interface-id | Name of the interface whose link state to set to default (e.g., ib0) |
| Default | N/A | |
| History | 25.02.2002 | |
| Example | `admin@nvos:~$ nv unset interface ib0 link`<br>`admin@nvos:~$ nv unset interface ib0 link state` | |
| REST API | PATCH https://<id>/nvue_v1/interface/{interface-id}/link | |
| Related commands | nv show interface<br>nv set interface link | |
| Notes | Since state is the only settable attribute of link, the two forms of the command are equivalent. | |

## 10.3 ibdiagnet

ibdiagnet is an InfiniBand diagnostic net tool that scans fabric by using route packets and then extracts from them all the available information about its connectivity and devices. As a result of running this tool, the log and dump files are produced and saved to the archive file 'ibdiagnet2_output.tgz'.

### 10.3.1 ibdiagnet Commands

- ibdiagnet Commands

### 10.3.2 ibdiagnet Commands


- 10.3.2.1 nv show ib ibdiagnet
- 10.3.2.2 nv show ib ibdiagnet files
- 10.3.2.3 nv action delete ib ibdiagnet files
- 10.3.2.4 nv action upload ib ibdiagnet files

- 10.3.2.5 nv action run ib cmd

## 10.3.2.1 nv show ib ibdiagnet

| | |
|---|---|
| | nv show ib ibdiagnet<br>Display content of ibdiagnet log file |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv show ib ibdiagnet` |
| REST API | GET https://<ip>/nvue_v1/ib/ibdiagnet |
| Related Commands | nv show ib ibdiagnet files<br>nv action upload ib ibdiagnet files {archive-name} {remote-url}<br>nv action delete ib ibdiagnet files {archive-name}<br>nv action run ib cmd <ib-cmd-str> |
| Notes | Log file is generated each time when 'nv action run ib cmd "ibdiagnet"' CLI is invoked. |

## 10.3.2.2 nv show ib ibdiagnet files

| | |
|---|---|
| | nv show ib ibdiagnet files<br>Display available ibdiagnet archive files in the system |
| Syntax Description | N/A |
| Default | N/A |
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv show ib ibdiagnet files`<br>`File name  Ibdiagnet archive file path`<br>`---------- ----------`<br>`ibdiagnet2_output.tgz  /host/ibdiagnet/ibdiagnet2_output.tgz` |
| REST API | GET https://<ip>/nvue_v1/ib/ibdiagnet/files |
| Related Commands | nv show ib ibdiagnet<br>nv action upload ib ibdiagnet files {archive-name} {remote-url}<br>nv action delete ib ibdiagnet files {archive-name}<br>nv action run ib cmd <ib-cmd-str> |
| Notes | Archive file is generated each time when 'nv action run ib cmd "ibdiagnet"' CLI is invoked. |

## 10.3.2.3 nv action delete ib ibdiagnet files

| | | |
|---|---|---|
| | nv action delete ib ibdiagnet files <archive-name><br>Remove ibdiagnet archive file from file system. | |
| Syntax Description | archive-name | Name of the ibdiagnet archive file. |
| Default | N/A | |

| | |
|---|---|
| History | 25.02.2002 |
| Example | `admin@nvos:~$ nv action delete ib ibdiagnet files ibdiagnet2_output.tgz`<br>`File delete successfully`<br>`Action succeeded` |
| REST API | POST https://<ip>/nvue_v1/ib/ibdiagnet/files/{archive-name} |
| Related Commands | nv show ib ibdiagnet<br>nv show ib ibdiagnet files<br>nv action upload ib ibdiagnet files {archive-name} {remote-url}<br>nv action run ib cmd <ib-cmd-str> |
| Notes | Available ibdiagnet archive files can be viewed via 'nv show ib ibdiagnet files' command. |

## 10.3.2.4 nv action upload ib ibdiagnet files

| | | |
|---|---|---|
| | nv action upload ib ibdiagnet files {archive-name} {remote-url}<br>Upload ibdiagnet archive file to remote host. | |
| Syntax Description | archive-name | Name of the ibdiagnet archive file. |
| | remote-url | Destination image file name<br>Remote url path to upload a file to.<br>Format: [protocol]://username[:password]@hostname/path/filename<br>Supported protocols: SCP, FTP, SFTP, and HTTPS |
| Default | N/A | |
| History | 25.02.2002<br>25.02.4002 Added HTTPS support in remote-url | |
| Example | `admin@nvos:~$ nv action upload ib ibdiagnet files ibdiagnet2_output.tgz scp://`<br>`username:password@host-name/home/logs/`<br>`File upload successfully`<br>`Action succeeded` | |
| REST API | POST https://<ip>/nvue_v1/ib/ibdiagnet/files/{archive-name} | |
| Related Commands | nv show ib ibdiagnet<br>nv show ib ibdiagnet files<br>nv action delete ib ibdiagnet files {archive-name}<br>nv action run ib cmd <ib-cmd-str> | |
| Notes | Available ibdiagnet archive files can be viewed via "nv show ib ibdiagnet files" command. | |

## 10.3.2.5 nv action run ib cmd

| | | |
|---|---|---|
| | nv action run ib cmd <ib-cmd-str><br>Run InfiniBand command (e.g., ibdiagnet). | |
| Syntax Description | ib-cmd-str | String with InfiniBand shell command to run |
| Default | N/A | |
| History | 25.02.2002 | |

| | |
|---|---|
| Example | <br>`admin@nvos:~$ nv action run ib cmd "ibdiagnet --get_phy_info"`<br>`Running ib command: ibdiagnet`<br>`ibdiagnet output files were archived into ibdiagnet2_output.tgz`<br>`Action succeeded` |
| REST API | POST https://<ip>/nvue_v1/ib/cmd -d '{ "@run" : {"state": "start", "parameters": {"cmd" : "ibdiagnet" }} }' |
| Related Commands | nv show ib ibdiagnet<br>nv show ib ibdiagnet files<br>nv action upload ib ibdiagnet files {archive-name} {remote-url}<br>nv action delete ib ibdiagnet files {archive-name} |
| Notes | Only ibdiagnet command is currently supported in command string. |

# 10.4 Fabric

## 10.4.1 Fabric Commands

- Fabric Commands

## 10.4.2 Fabric Commands

- 10.4.2.1 show ib device

### 10.4.2.1 show ib device

| | | |
|---|---|---|
| | nv show ib device [device-id]<br>Shows InfiniBand devices' information. | |
| Syntax Description | device-id | Optional: show information only for the specified IB device |
| Default | N/A | |
| Configuration Mode | config | |
| History | 25.02.2002 | |
| Example | <br>`root@nvos:~$ nv show ib device`<br>`Device  Type  IB Subnet  GUID  LID`<br>`------  ----  ----------  ----------  ---`<br>`ASIC1  QTM  infiniband-default  98:03:9B:03:00:8D:60:FC  0`<br>`SYSTEM  -  -  98:03:9B:03:00:8D:60:FC  0` | |
| REST API | GET https://<id>/nvue_v1/ib/device<br>GET https://<id>/nvue_v1/ib/device/{device-id} | |
| Related Commands | | |
| Notes | | |

# 11 Appendix—Moving from MLNX-OS to NVOS

To install NVOS, you use ONIE (Open Network Install Environment), an extension to the traditional U-Boot software that allows for automatic discovery of a network installer image. This facilitates the ecosystem model of procuring switches with an operating system choice, such as NVOS. The easiest way to install NVOS with ONIE is with local HTTP discovery:

1. If your host (laptop or server) is IPv6-enabled, make sure it is running a web server. If your host is IPv4-enabled, make sure it is running DHCP in addition to a web server.
2. Download the NVOS installation file to the root directory of the web server. Rename this file `onie-installer`.
3. Connect your host using an Ethernet cable to the management Ethernet port of the switch.
4. Power on the switch. The switch downloads the ONIE image installer and boots. You can watch the installation progress in your terminal. After the installation completes, the NVOS login prompt appears in the terminal window.

> These steps describe a flexible unattended installation method; you do not need a console cable. A fresh install with ONIE using a local web server typically completes in less than ten minutes. However, you have more options for installing NVOS with ONIE, such as using a local file, FTP or USB. See Installing a New NVOS Image for more options.

After installing NVOS, you are ready to:

- Log in to NVOS on the switch.
- Configure NVOS. This quick start guide provides instructions on configuring switch ports interface.

# 12 Document Revision History

Version 25.02.6077—November 2025

Added:

- `--expand` option to the command nv config show
- `--expand` option to the command nv config diff
- `--expand` option to the command nv config find
- Support for text file containing NVUE commands via nv config patch and nv config replace

Updated:

- The default of the command nv set system security password-hardening state to `disabled`
- The defalt of BIOS auto-update to `disabled`

Version 25.02.5026—October 2025

Added:

- The section Authorization Commands
- A note in the section Remote Logging

Version 25.02.5019/25.02.5021—September 2025

There are no changes to this version of the user manual. For further information on bug fixes and improvements, see the release notes of this software version.

**Version 25.02.5002—July 2025**

Added:

- Two new operation codes (44 and 45) to the table Link Down Reason Indication
- New events to "System-Services-Related Events" section to the table Detailed Table of Events
- New event to "ASIC-Related Events" in the table Detailed Table of Events
- An update to dhcp-client-identifier to include in the Zero-Touch Provisioning section
- The command nv set/unset system ntp listen

- The command nv set/unset system cli inactive-timeout
- The command nv show system cli
- The command nv show system syslog selector
- The command nv show system syslog selector id
- The command nv show system syslog selector filter
- The command nv show system syslog selector filter id
- The command nv show system syslog selector rate-limit
- The command nv show system version image
- The command nv show system version packages installed
- The command nv show system version packages installed id
- The command nv show system ntp server detail (used to be `nv show system ntp server query`)
- The command nv show system date-time

Updated:

- The modes of the command nv action reboot system
- The output of the command nv show system serial-console
- The command "nv show system events last" to nv show system events --last
- The command "nv show system events recent" to nv show system events --recent
- The output of the command nv show system version
- The command `nv set system ssh-server inactivity-timeout` to nv set/unset system ssh-server inactive-timeout
- The command `nv set system ssh-server ports` to nv set/unset system ssh-server port
- The output of the command nv show system
- The output of the command nv show platform
- The output of the command nv show system syslog
- The output of the command nv show system syslog server
- The output of the command nv show system syslog server id
- The output of the command nv show system ntp
- The output of the command nv show system ntp server
- The command `nv set system timezone` to nv set/unset system date-time timezone
- The output of the command nv show system events to reflect Etc/UTC event timestamp

Removed:

- The command nv set/unset system syslog trap
- The command nv set system syslog format welf (use nv set system syslog format welf firewall-name <name>, instead)
- The "detail" option to the command nv show platform transceiver
- Note in Certificates Management section
- Note under Upgrading OS Software section

Version 25.02.4002—May 2025

Added:

- The command nv show system aaa user spiffe-id
- The command nv set/unset system aaa user spiffe-id
- The command nv show system gnmi-server mtls
- The command nv set system gnmi-server mtls ca-certificate
- The table Link Down Reason Indication
- The command nv set acl rule action set dscp
- The subsection Set DSCP on Transit Traffic in the Access Control List Configuration section

Updated:

- NVOS group IDs in the LDAP section
- The output of the command nv show system
- The output of the command nv show system cpu
- The remote-url options to include HTTPS in the following upload commands:
    - nv action upload system stats files

    - nv action upload system image files
    - nv action upload platform firmware files
    - nv action upload system documentation files
    - nv action upload system security tpm
    - nv action upload system config files
    - nv action upload system tech-support files

    - nv action upload ib ibdiagnet files
- The subsection Recovery Flow After SSD Wipe
- GRUB timeout style

Version 25.02.3000—March 2025

Added:

- A subsection in the Troubleshooting section
- A note in the command nv action reset system factory-default
- Added commands to the Role Based Access Control Commands section
- The command nv show system disk
- The command nv show system disk usage
- The command nv action erase system disk
- The command nv show system log file list
- The command nv show system security tpm oiak
- The command nv action import system security tpm oiak
- The command nv action delete system security tpm oiak
- The command nv show system aaa tacacs authentication

- The subsection ZTP Config provisioning-script
- The subsection Provisioning Script Example

Updated:

- The section Role Based Access Control
- The Supported Events table
- Output of the command nv show platform transceiver
- Output of the command nv show system image
- Output of the command nv show system log to display log configurations
- Output of the command nv show system log file to display the contents of the latest syslog
- Output of the command nv show system ntp
- Output of the command nv show system aaa ldap
- The command `nv show system log files` to nv show system log file
- The "nvued" component to "nvue" (see Logging Commands section)
- The command `nv show system aaa tacacs hostname` to nv show system aaa tacacs server
- The command `nv set system aaa tacacs hostname` to nv set system aaa tacacs server
- The command `nv set system aaa tacacs hostname auth-port` to nv set system aaa tacacs server auth-port

- The command `nv set system aaa tacacs hostname auth-mode` to nv set system aaa tacacs server auth-mode
- The command `nv set system aaa tacacs hostname secret` to nv set system aaa tacacs server secret
- The command `nv set system aaa tacacs hostname priority` to nv set system aaa tacacs server priority
- The command `nv set system aaa tacacs hostname timeout` to nv set system aaa tacacs server timeout
- The command `nv set system aaa tacacs auth-type` to nv set system aaa tacacs authentication mode
- The command `nv set system aaa tacacs hostname auth-type` to nv set system aaa tacacs server auth-mode
- The command `nv show system aaa radius hostname` to nv show system aaa radius server
- The command `nv show system aaa radius hostname id` to nv show system aaa radius server id
- The command `nv set system aaa radius hostname` to nv set system aaa radius server
- The command `nv set system aaa radius hostname auth-port` to nv set system aaa radius server auth-port
- The command `nv set system aaa radius hostname auth-type` to nv set system aaa radius server auth-type
- The command `nv set system aaa radius hostname secret` to nv set system aaa radius server secret
- The command `nv set system aaa radius hostname priority` to nv set system aaa radius server priority
- The command `nv set system aaa radius hostname retransmit` to nv set system aaa radius server retransmit
- The command `nv set system aaa radius hostname timeout` to nv set system aaa radius server timeout
- The command `nv show system aaa ldap hostname` to nv show system aaa ldap server
- The command `nv set system aaa ldap hostname id` to nv set system aaa ldap server id
- The command `nv set system aaa ldap hostname` to nv set system aaa ldap server

Removed:

- The command `nv set system aaa ldap ssl ca-list`

Version 25.02.2xxx—January 2025

This is the initial release of NVOS software documentation for InfiniBand switches.

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