# Cumulus NetQ CLI User Guide

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This guide is intended for network administrators who are responsible for monitoring and troubleshooting the network in their data center environment. NetQ 2.x offers the ability to easily monitor and manage your data center network infrastructure and operational health. This guide provides instructions and information about monitoring individual components of the network, the network as a whole, and the NetQ software itself using the NetQ command line interface (CLI). If you prefer to use a graphical interface, refer to the Cumulus NetQ UI User Guide.

# NetQ Command Line Overview

The NetQ CLI provides access to all of the network state and event information collected by the NetQ Agents. It behaves the same way most CLIs behave, with groups of commands used to display related information, the ability to use TAB completion when entering commands, and to get help for given commands and options. The commands are grouped into four categories: check, show, config, and trace.

> NOTE
>
> The NetQ command line interface only runs on switches and server hosts implemented with Intel x86 or ARM-based architectures. If you are unsure what architecture your switch or server employs, check the Cumulus Hardware Compatibility List and verify the value in the **Platforms** tab > **CPU** column.

## CLI Access

When NetQ is installed or upgraded, the CLI may also be installed and enabled on your NetQ server or appliance and hosts. Refer to the Install NetQ and Upgrade NetQ topics for details.

To access the CLI from a switch or server:

1. Log in to the device. This example uses the default username of *cumulus* and a hostname of *switch*.

```
<computer>:~<username>$ ssh cumulus@switch
```

2. Enter your password to reach the command prompt. The default password is *CumulusLinux!* For example:

```
Enter passphrase for key '/Users/<username>/.ssh/id_rsa': <enter
CumulusLinux! here>
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-112-generic x86_64)
 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage
Last login: Tue Sep 15 09:28:12 2019 from 10.0.0.14
cumulus@switch:~$
```

3. Run commands. For example:

```
cumulus@switch:~$ netq show agents
cumulus@switch:~$ netq check bgp
```

## Command Line Basics

This section describes the core structure and behavior of the NetQ CLI. It includes the following:

- Command Line Structure
- Command Syntax
- Command Output
- Command Prompts

- Command Completion
- Command Help
- Command History

## Command Line Structure

The Cumulus NetQ command line has a flat structure as opposed to a modal structure. This means that all commands can be run from the primary prompt instead of only in a specific mode. For example, some command lines require the administrator to switch between a configuration mode and an operation mode. Configuration commands can only be run in the configuration mode and operational commands can only be run in operation mode. This structure requires the administrator to switch between modes to run commands which can be tedious and time consuming. Cumulus NetQ command line enables the administrator to run all of its commands at the same level.

## Command Syntax

NetQ CLI commands all begin with `netq`. Cumulus NetQ commands fall into one of four syntax categories: validation (check), monitoring (show), configuration, and trace.

```
netq check <network-protocol-or-service> [options]
netq show <network-protocol-or-service> [options]
netq config <action> <object> [options]
netq trace <destination> from <source> [options]
```

| Symbols | Meaning |
| --- | --- |
| Parentheses ( ) | Grouping of required parameters. Choose one. |
| Square brackets [ ] | Single or group of optional parameters. If more than one object or keyword is available, choose one. |

| Symbols | Meaning |
|---|---|
| Angle brackets < > | Required variable. Value for a keyword or option; enter according to your deployment nomenclature. |
| Pipe \| | Separates object and keyword options, also separates value options; enter one object or keyword and zero or one value. |

For example, in the `netq check` command:

- [<hostname>] is an optional parameter with a variable value named *hostname*
- <network-protocol-or-service> represents a number of possible key words, such as *agents*, *bgp*, *evpn,* and so forth
- <options> represents a number of possible conditions for the given object, such as *around*, *vrf,* or *json*

Thus some valid commands are:

- `netq leaf02 check agents json`
- `netq show bgp`
- `netq config restart cli`
- `netq trace 10.0.0.5 from 10.0.0.35`

### Command Output

The command output presents results in color for many commands. Results with errors are shown in red, and warnings are shown in yellow. Results without errors or warnings are shown in either black or green. VTEPs are shown in blue. A node in the *pretty* output is shown in **bold**, and a router interface is wrapped in angle brackets (< >). To view the output with only black text, run the `netq config del color` command. You can view output with colors again by running `netq config add color`.

All check and show commands are run with a default timeframe of now to one hour ago, unless you specify an approximate time using the `around` keyword. For example, running `netq check bgp` shows the status of BGP over the last hour. Running `netq show bgp around 3h` shows the status of BGP three hours ago.

### Command Prompts

NetQ code examples use the following prompts:

- `cumulus@switch:~$` Indicates the user *cumulus* is logged in to a switch to run the example command
- `cumulus@host:~$` Indicates the user *cumulus* is logged in to a host to run the example command
- `cumulus@netq-appliance:~$` Indicates the user *cumulus* is logged in to either the NetQ Appliance or NetQ Cloud Appliance to run the command

The switches must be running the Cumulus Linux operating system (OS), NetQ Platform software, and the NetQ Agent. The hosts must be running CentOS, RHEL, or Ubuntu OS and the NetQ Agent. Refer to the Install NetQ topic for details.

### 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 `netq check` displays the possible objects for the command, and returns you to the command prompt to complete the command.

```
cumulus@switch:~$ netq check <<press Tab>>
    agents      :  Netq agent
    bgp         :  BGP info
    cl-version  :  Cumulus Linux version
    clag        :  Cumulus Multi-chassis LAG
    evpn        :  EVPN
    interfaces  :  network interface port
```

```
    license     :  License information
    lnv         :  Lightweight Network Virtualization info
    mtu         :  Link MTU
    ntp         :  NTP
    ospf        :  OSPF info
    sensors     :  Temperature/Fan/PSU sensors
    vlan        :  VLAN
    vxlan       :  VXLAN data path
cumulus@switch:~$ netq check
```

### Command Help

As you enter commands, you can get help with command syntax by entering `help` at various points within a command entry. For example, to find out what options are available for a BGP check, enter `help` after entering a portion of the `netq check` command. In this example, you can see that there are no additional required parameters and two optional parameters, `vrf` and `around`, that can be used with a BGP check.

```
cumulus@switch:~$ netq check bgp help
Commands:
   netq check bgp [vrf <vrf>] [around <text-time>] [json]
cumulus@switch:~$
```

To see an exhaustive list of commands, run:

```
cumulus@switch:~$ netq help list verbose
```

#### Command History

The CLI stores commands issued within a session, which enables you to review and rerun commands that have already been run. At the command prompt, press the **Up Arrow** and **Down Arrow** keys to move back and forth through the list of commands previously entered. When you have found a given command, you can run the command by pressing **Enter**, just as you would if you had entered it manually. Optionally you can modify the command before you run it.

## Command Categories

While the CLI has a flat structure, the commands can be conceptually grouped into four functional categories:

- Validation Commands
- Monitoring Commands
- Configuration Commands
- Trace Commands

#### Validation Commands

The `netq check` commands enable the network administrator to validate the current or historical state of the network by looking for errors and misconfigurations in the network. The commands run fabric-wide validations against various configured protocols and services to determine how well the network is operating. Validation checks can be performed for the following:

- **agents**: NetQ Agents operation on all switches and hosts
- **bgp**: BGP (Border Gateway Protocol) operation across the network fabric
- **clag**: Cumulus Multi-chassis LAG (link aggregation) operation
- **cl-version**: Cumulus Linux version
- **evpn**: EVPN (Ethernet Virtual Private Network) operation

- **interfaces**: network interface port operation
- **license**: License status
- **lnv**: Lightweight Network Virtualization operation
- **mtu**: Link MTU (maximum transmission unit) consistency across paths
- **ntp**: NTP (Network Time Protocol) operation
- **ospf**: OSPF (Open Shortest Path First) operation
- **sensors**: Temperature/Fan/PSU sensor operation
- **vlan**: VLAN (Virtual Local Area Network) operation
- **vxlan**: VXLAN (Virtual Extensible LAN) data path operation

The commands take the form of `netq check <network-protocol-or-service> [options]`, where the options vary according to the protocol or service.

This example shows the output for the `netq check bgp` command, followed by the same command using the `json` option. If there had been any failures, they would be have been listed below the summary results or in the *failedNodes* section, respectively.

```
cumulus@switch:~$ netq check bgp
Total Nodes: 8, Failed Nodes: 0, Total Sessions: 30, Failed Sessions: 0

cumulus@switch:~$ netq check bgp json
{
   "failedNodes":[
   ],
   "summary":{
      "checkedNodeCount":8,
      "failedSessionCount":0,
      "failedNodeCount":0,
      "totalSessionCount":30
```

```
    }
}
```

### Monitoring Commands

The `netq show` commands enable the network administrator to view details about the current or historical configuration and status of the various protocols or services. The configuration and status can be shown for the following:

- **agents**: NetQ Agents status on switches and hosts
- **bgp**: BGP status across the network fabric
- **clag**: CLAG status
- **events**: Display changes over time
- **evpn**: EVPN status
- **interface-stats**: Interface statistics
- **interface-utils**: Interface statistics plus utilization
- **interfaces**: network interface port status
- **inventory**: hardware component information
- **ip**: IPv4 status
- **ipv6**: IPv6 status
- **kubernetes**: Kubernetes cluster, daemon, pod, node, service and replication status
- **lldp**: LLDP status
- **lnv**: Lightweight Network Virtualization status
- **macs**: MAC table or address information
- **notification**: Slack or PagerDuty notification configurations
- **ntp**: NTP status
- **opta-health**: Display health of apps on the OPTA
- **ospf**: OSPF status
- **platform** Appliance version info

- **sensors**: Temperature/Fan/PSU sensor status
- **services**: System services status
- **vlan**: VLAN status
- **vxlan**: VXLAN data path status

The commands take the form of `netq [<hostname>] show <network-protocol-or-service> [options]`, where the options vary according to the protocol or service. The commands can be restricted from showing the information for *all* devices to showing information for a selected device using the `hostname` option.

This example shows the standard and restricted output for the `netq show agents` command.

```
cumulus@switch:~$ netq show agents
Matching agents records:
Hostname     Status     NTP Sync Version                    Sys Uptime
Agent Uptime       Reinitialize Time      Last Changed
----------------- ---------------- -------- ----------------------------------- -------------------------
------------------------ ------------------------ ------------------------
exit01     Fresh     yes   2.3.0-cl3u21~1569246310.30858c3   15h:34m:
15s      15h:34m:5s      15h:34m:5s      Mon Sep 23 22:44:49 2019
exit02     Fresh     yes   2.3.0-cl3u21~1569246310.30858c3   15h:35m:
57s      15h:35m:47s      15h:35m:47s      Mon Sep 23 22:43:09 2019
leaf01     Fresh     yes   2.3.0-cl3u21~1569246310.30858c3   15h:35m:
10s      15h:35m:1s      15h:35m:1s      Mon Sep 23 22:43:55 2019
leaf02     Fresh     yes   2.3.0-cl3u21~1569246310.30858c3   15h:35m:
53s      15h:35m:43s      15h:35m:43s      Mon Sep 23 22:44:17 2019
leaf03     Fresh     yes   2.3.0-cl3u21~1569246310.30858c3   15h:35m:
0s      15h:34m:51s      15h:34m:51s      Mon Sep 23 22:44:01 2019
leaf04     Fresh     yes   2.3.0-cl3u21~1569246310.30858c3   15h:36m:
```

```
33s          15h:36m:24s          15h:36m:24s          Mon Sep 23 22:43:03 2019
server01       Fresh        no     2.3.0-ub18.04u21~1569246309.30858c3  15h:14m:
46s          15h:14m:34s          15h:14m:34s          Mon Sep 23 22:48:56 2019
server02       Fresh        yes     2.3.0-ub18.04u21~1569246309.30858c3  15h:
14m:46s          15h:14m:34s          15h:14m:34s          Mon Sep 23 22:49:24
2019
server03       Fresh        yes     2.3.0-ub18.04u21~1569246309.30858c3  15h:
14m:46s          15h:14m:34s          15h:14m:34s          Mon Sep 23 22:49:24
2019
server04       Fresh        yes     2.3.0-ub18.04u21~1569246309.30858c3  15h:
14m:45s          15h:14m:33s          15h:14m:33s          Mon Sep 23 22:49:24
2019
spine01        Fresh        yes     2.3.0-cl3u21~1569246310.30858c3     15h:34m:
6s          15h:33m:57s          15h:33m:57s          Mon Sep 23 22:44:27 2019
spine02        Fresh        yes     2.3.0-cl3u21~1569246310.30858c3     15h:34m:
12s          15h:34m:2s          15h:34m:2s          Mon Sep 23 22:43:30 2019
```

```
cumulus@switch:~$ netq show agents json
{
    "agents":[
        {
            "status":"Fresh",
            "lastChanged":1569278689.0,
            "reinitializeTime":1569277757.0,
            "hostname":"exit01",
            "version":"2.3.0-cl3u21~1569246310.30858c3",
            "sysUptime":1569277747.0,
            "ntpSync":"yes",
```

```
        "agentUptime":1569277757.0
    },
    {
        "status":"Fresh",
        "lastChanged":1569278589.0,
        "reinitializeTime":1569277655.0,
        "hostname":"exit02",
        "version":"2.3.0-cl3u21~1569246310.30858c3",
        "sysUptime":1569277645.0,
        "ntpSync":"yes",
        "agentUptime":1569277655.0
    },
    {
        "status":"Fresh",
        "lastChanged":1569278635.0,
        "reinitializeTime":1569277701.0,
        "hostname":"leaf01",
        "version":"2.3.0-cl3u21~1569246310.30858c3",
        "sysUptime":1569277692.0,
        "ntpSync":"yes",
        "agentUptime":1569277701.0
    },
...
```


```
cumulus@switch:~$ netq leaf01 show agents
Matching agents records:
Hostname      Status      NTP Sync Version                  Sys Uptime
Agent Uptime        Reinitialize Time       Last Changed
```

```
---------------- ---------------- -------- ----------------------------------- ------------------------
------------------------ ------------------------- ------------------------
leaf01          Fresh          yes     2.3.0-cl3u21~1569246310.30858c3     15h:57m:
24s          15h:57m:15s          15h:57m:15s          Mon Sep 23 22:43:55 2019
```

### Configuration Commands

The `netq config` and `netq notification` commands enable the network administrator to manage NetQ Agent and CLI server configuration, set up container monitoring, and event notification.

#### NETQ AGENT CONFIGURATION

The agent commands enable the network administrator to configure individual NetQ Agents. Refer to Cumulus NetQ Components for a description of NetQ Agents, to Manage NetQ Agents, or to Install NetQ Agents and CLI on Switches for more detailed usage examples.

The agent configuration commands enable you to add and remove agents from switches and hosts, start and stop agent operations, add and remove Kubernetes container monitoring, add or remove sensors, debug the agent, and add or remove FRR (FRRouting).

> NOTE
>
> Commands apply to one agent at a time, and are run from the switch or host where the NetQ Agent resides.

The agent configuration commands include:

```
netq config (add|del|show) agent
netq config (start|stop|status|restart) agent
```

This example shows how to configure the agent to send sensor data.

```
cumulus@switch~:$ netq config add agent sensors
```

This example shows how to start monitoring with Kubernetes.

```
cumulus@switch:~$ netq config add agent kubernetes-monitor poll-period 15
```

This example shows how to view the NetQ Agent configuration.

```
cumulus@switch:~$ netq config show agent
netq-agent            value      default
--------------------  ---------  ---------
enable-opta-discovery  True       True
exhibitport
agenturl
server                127.0.0.1  127.0.0.1
exhibiturl
vrf                   default    default
agentport             8981       8981
port                  31980      31980
```

> NOTE
>
> After making configuration changes to your agents, you must restart the agent for the changes to take effect. Use the `netq config restart agent` command.

CLI CONFIGURATION

The CLI commands enable the network administrator to configure and manage the CLI component. These commands enable you to add or remove CLI (essentially enabling/disabling the service), start and restart it, and view the configuration of the service.

> NOTE
>
> Commands apply to one device at a time, and are run from the switch or host where the CLI is run.

The CLI configuration commands include:

```
netq config add cli server
netq config del cli server
netq config show cli premises [json]
netq config show (cli|all) [json]
netq config (status|restart) cli
```

This example shows how to restart the CLI instance.

```
cumulus@switch~:$ netq config restart cli
```

This example shows how to enable the CLI on a NetQ Platform or NetQ Appliance.

```
cumulus@switch~:$ netq config add cli server 10.1.3.101
```

This example shows how to enable the CLI on a NetQ Cloud Appliance with a single premise.

```
netq config add cli server api.netq.cumulusnetworks.com access-key <user-access-key> secret-key <user-secret-key> port 443
```

#### EVENT NOTIFICATION COMMANDS

The notification configuration commands enable you to add, remove and show notification application integrations. These commands create the channels, filters, and rules needed to control event messaging. The commands include:

```
netq (add|del|show) notification channel
netq (add|del|show) notification rule
netq (add|del|show) notification filter
netq (add|del|show) notification proxy
```

An integration includes at least one channel (PagerDuty, Slack, or syslog), at least one filters (defined by rules you create), and at least one rule.

This example shows how to configure a PagerDuty channel:

```
cumulus@switch:~$ netq add notification channel pagerduty pd-netq-events
integration-key c6d666e210a8425298ef7abde0d1998
Successfully added/updated channel pd-netq-events
```

Refer to Integrate NetQ with Notification Applications for details about using these commands and additional examples.

### Trace Commands

The `trace` commands enable the network administrator to view the available paths between two nodes on the network currently and at a time in the past. You can perform a layer 2 or layer 3 trace, and view the output in one of three formats (*json*, *pretty*, and *detail*). JSON output provides the output in a JSON file format for ease of importing to other applications or software. Pretty output lines up the paths in a pseudo-graphical manner to help visualize multiple paths. Detail output is useful for traces with higher hop counts where the pretty output wraps lines, making it harder to interpret the results. The detail output displays a table with a row for each path.

The trace command syntax is:

```
netq trace <mac> [vlan <1-4096>] from (<src-hostname>|<ip-src>) [vrf <vrf>]
[around <text-time>] [json|detail|pretty] [debug]
netq trace <ip> from (<src-hostname>|<ip-src>) [vrf <vrf>] [around <text-time>]
[json|detail|pretty] [debug]
```

**Example** Running a trace based on the destination IP address, in *pretty* output with a small number of resulting paths:

```
cumulus@switch:~$ netq trace 10.0.0.11 from 10.0.0.14 pretty
Number of Paths: 6
  Inconsistent PMTU among paths
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 9000
 leaf04 swp52 -- swp4 spine02 swp2 -- swp52 leaf02 peerlink.4094 -- peerlink.4094 leaf01 lo
                                                    peerlink.4094 -- peerlink.4094 leaf01 lo
 leaf04 swp51 -- swp4 spine01 swp2 -- swp51 leaf02 peerlink.4094 -- peerlink.4094 leaf01 lo
                                                    peerlink.4094 -- peerlink.4094 leaf01 lo
 leaf04 swp52 -- swp4 spine02 swp1 -- swp52 leaf01 lo
 leaf04 swp51 -- swp4 spine01 swp1 -- swp51 leaf01 lo
```

**Example** Running a trace based on the destination IP address, in *detail* output with a small number of resulting paths:

```
cumulus@switch:~$ netq trace 10.0.0.11 from 10.0.0.14 detail
Number of Paths: 6
  Inconsistent PMTU among paths
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 9000
```

```
Id  Hop Hostname        InPort          InVlan InTunnel              InRtrIf         InVRF
OutRtrIf        OutVRF          OutTunnel             OutPort         OutVlan
--- --- --------------- --------------- ------ --------------------- --------------- --------------- ---------------
--------------- --------------------- --------------- -------
1   1   leaf04                                                       swp52
default                         swp52
    2   spine02         swp4                                  swp4            default         swp2
default                         swp2
    3   leaf02          swp52                                 swp52           default         peerlink.
4094   default                          peerlink.4094
    4   leaf01          peerlink.4094                         peerlink.4094
default                                                lo
--- --- --------------- --------------- ------ --------------------- --------------- --------------- ---------------
--------------- --------------------- --------------- -------
2   1   leaf04                                                       swp52
default                         swp52
    2   spine02         swp4                                  swp4            default         swp2
default                         swp2
    3   leaf02          swp52                                 swp52           default         peerlink.
4094   default                          peerlink.4094
    4   leaf01          peerlink.4094                         peerlink.4094
default                                                lo
--- --- --------------- --------------- ------ --------------------- --------------- --------------- ---------------
--------------- --------------------- --------------- -------
3   1   leaf04                                                       swp51
default                         swp51
    2   spine01         swp4                                  swp4            default         swp2
default                         swp2
    3   leaf02          swp51                                 swp51           default         peerlink.
```

```
4094   default                  peerlink.4094
   4   leaf01       peerlink.4094              peerlink.4094
default                                  lo
--- --- --------------- --------------- ------ -------------------- --------------- --------------- ---------------
--------------- -------------------- --------------- -------
4   1   leaf04                                              swp51
default                   swp51
   2   spine01      swp4                       swp4        default      swp2
default                   swp2
   3   leaf02       swp51                      swp51       default      peerlink.
4094   default                  peerlink.4094
   4   leaf01       peerlink.4094              peerlink.4094
default                                  lo
--- --- --------------- --------------- ------ -------------------- --------------- --------------- ---------------
--------------- -------------------- --------------- -------
5   1   leaf04                                              swp52
default                   swp52
   2   spine02      swp4                       swp4        default      swp1
default                   swp1
   3   leaf01       swp52                      swp52
default                                  lo
--- --- --------------- --------------- ------ -------------------- --------------- --------------- ---------------
--------------- -------------------- --------------- -------
6   1   leaf04                                              swp51
default                   swp51
   2   spine01      swp4                       swp4        default      swp1
default                   swp1
   3   leaf01       swp51                      swp51
default                                  lo
```

```
--- --- --------------- --------------- ------ -------------------- --------------- --------------- ---------------
--------------- -------------------- --------------- -------
```

**Example** Running a trace based on the destination MAC address, in *pretty* output:

```
cumulus@switch:~$ netq trace A0:00:00:00:00:11 vlan 1001 from Server03 pretty
Number of Paths: 6
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 9152

 Server03 bond1.1001 -- swp7 <vlan1001> Leaf02 vni: 34 swp5 -- swp4 Spine03
swp7 -- swp5 vni: 34 Leaf04 swp6 -- swp1.1001 Server03 <swp1.1001>
                                               swp4 -- swp4 Spine02 swp7 -- swp4 vni: 34 Leaf04
swp6 -- swp1.1001 Server03 <swp1.1001>
                                               swp3 -- swp4 Spine01 swp7 -- swp3 vni: 34 Leaf04
swp6 -- swp1.1001 Server03 <swp1.1001>
         bond1.1001 -- swp7 <vlan1001> Leaf01 vni: 34 swp5 -- swp3 Spine03 swp7 --
swp5 vni: 34 Leaf04 swp6 -- swp1.1001 Server03 <swp1.1001>
                                               swp4 -- swp3 Spine02 swp7 -- swp4 vni: 34 Leaf04
swp6 -- swp1.1001 Server03 <swp1.1001>
                                               swp3 -- swp3 Spine01 swp7 -- swp3 vni: 34 Leaf04
swp6 -- swp1.1001 Server03 <swp1.1001>
```

# Command Changes

A number of commands have changed in this release to accommodate the addition of new keywords and options or to simplify their syntax. Additionally, new commands have been added and others have been removed. A summary of those changes is provided here.

## New Commands

The following table summarizes the new commands available with this release.

| Command | Summary | Version |
|---|---|---|
| netq [<hostname>] show cl-btrfs-info [around <text-time>] [json] | Displays status about disk utilization on all devices with BTRFS and Cumulus Linux 3.x installed. | 2.3.1 |
| netq [<hostname>] show cl-pkg-info [<text-package-name>] [around <text-time>] [json] | Displays version information for all software packages installed on a device. | 2.3.1 |
| netq [<hostname>] show cl-ssd-util [around <text-time>] [json] | Displays status for 3ME3 solid state drive (SSD) utilization on all devices. | 2.3.1 |
| netq [<hostname>] show mac-history <mac> [vlan <1-4096>] [diff] [between <text-time> and <text-endtime>] [listby <text-list-by>] [json] | Displays where a MAC address has resided in the network, or when the *diff* option is applied, the difference between two points in time. The *listby* option lets you determine how the output data is displayed. | 2.3.1 |

| | | |
|---|---|---|
| netq check cl-version [match-version <cl-ver> \| min-version <cl-ver>] [include <version-number-range-list> \| exclude <version-number-range-list>] [around <text-time>] [json \| summary] | When no options are used, validates that the Cumulus Linux version running on all of the monitored nodes is consistent. When *min-version* is provided, validates CL version is equal or greater than specified version. When *match-version* is provided, validates all nodes are using specified version. | 2.3.0 |
| netq [<hostname>] show interface-utils [<text-port>] [tx\|rx] [around <text-time>] [json] | Similar to `netq show interface-stats`, this command displays NetQ server or appliance interface receive and transmit statistics, but it also shows utilization and port speed. | 2.3.0 |
| netq show platform [json] | Displays the NetQ software version installed on your NetQ server or appliance and how long it has been up. Note change to command in 2.3.1. | 2.3.0 |

### Modified Commands

The following table summarizes the commands that have been changed with this release.

| Updated Command | Old Command | What Changed | Version |
| --- | --- | --- | --- |
| netq install opta interface <text-opta-ifname> tarball (<text-tarball-name> \| download \| download <text-opta-version>) config-key <text-opta-key> [proxy-host <text-proxy-host> proxy-port <text-proxy-port>] [file <text-config-file>] [force] | netq install opta interface <text-opta-ifname> tarball (<text-tarball-name> \| download \| download <text-opta-version>) config-key <text-opta-key> [proxy-host <text-proxy-host> proxy-port <text-proxy-port>] [file <text-config-file>] [force] | Added the *proxy-host* option that lets you communicate through a proxy server versus directly with the NetQ server or appliance. | 2.3.1 |
| netq upgrade opta tarball (<text-tarball-name> \| download \| download <text-opta-version>) [proxy-host <text-proxy-host> proxy-port <text-proxy-port>] | netq upgrade opta tarball (<text-tarball-name> \| download \| download <text-opta-version>) | Added the *proxy-host* option that lets you communicate through a proxy server versus directly with the NetQ server or appliance. | 2.3.1 |
| netq show opta-platform [json] | netq show platform [json] | Modified the keyword name from *platform* to *opta-platform*. | 2.3.1 |

| Updated Command | Old Command | What Changed | Version |
|---|---|---|---|
| netq [<hostname>] show events [level info \| level error \| level warning \| level critical \| level debug] [type clsupport \| type ntp \| type mtu \| type configdiff \| type vlan \| type trace \| type vxlan \| type clag \| type bgp \| type interfaces \| type interfaces-physical \| type agents \| type ospf \| type evpn \| type lnv \| type macs \| type services \| type lldp \| type license \| type os \| type sensors \| type btrfsinfo] [between <text-time> and <text-endtime>] [json] | netq [<hostname>] show events [level info \| level error \| level warning \| level critical \| level debug] [type clsupport \| type ntp \| type mtu \| type configdiff \| type vlan \| type trace \| type vxlan \| type clag \| type bgp \| type interfaces \| type interfaces-physical \| type agents \| type ospf \| type evpn \| type lnv \| type macs \| type services \| type lldp \| type license \| type os \| type sensors] [between <text-time> and <text-endtime>] [json] | Added the *cl-btrfs-info* type option to view events related to BTRFS disk utilization. | 2.3.1 |

| Updated Command | Old Command | What Changed | Version |
| --- | --- | --- | --- |
| netq config add cli server <text-gateway-dest> [access-key <text-access-key> secret-key <text-secret-key> premises <text-premises-name> \| cli-keys-file <text-key-file> premises <text-premises-name>] [vrf <text-vrf-name>] [port <text-gateway-port>]<br><br>netq config add cli server <text-gateway-dest> [access-key <text-access-key> secret-key <text-secret-key> \| cli-keys-file <text-key-file>] [vrf <text-vrf-name>] [port <text-gateway-port>] | netq config add cli server <text-gateway-dest> [access-key <text-access-key> secret-key <text-secret-key> \| cli-keys-file <text-key-file>] [premise <text-premise-name>] [port <text-gateway-port>] [vrf <text-vrf-name>] | Adds the CLI daemon to the switch or host where this command is run. Split command into two: the first for when you want to specify the premises, the second for when you want to use the first premises in your list of premises. The *access-key*, *secret-key*, and *port* are required for cloud deployments. The *text-gateway-dest* is the only required value for on-premises deployments. | 2.3.0 |

## Deprecated Commands

The following table summarizes the commands that have been removed and a recommended alternative, if appropriate.

| Command | Alternate Command | Version |
| --- | --- | --- |
| netq config add cli server <text-gateway-dest> [access-key <text-access-key> secret-key <text-secret-key> \| cli-keys-file <text-key-file>] [vrf <text-vrf-name>] [port <text-gateway-port>] | netq config add cli server <text-gateway-dest> [access-key <text-access-key> secret-key <text-secret-key> premises <text-premises-name> \| cli-keys-file <text-key-file> premises <text-premises-name>] [vrf <text-vrf-name>] [port <text-gateway-port>] | 2.3.1 |

# Monitor Overall Network Health

NetQ provides the information you need to monitor the health of your network fabric, devices, and interfaces. You are able to easily validate the operation and view the configuration across the entire network from switches to hosts to containers. For example, you can monitor the operation of routing protocols and virtual network configurations, the status of NetQ Agents and hardware components, and the operation and efficiency of interfaces. When issues are present, NetQ makes it easy to identify and resolve them. You can also see when changes have occurred to the network, devices, and interfaces by viewing their operation, configuration, and status at an earlier point in time.

## Validate Network Health

NetQ `check` commands validate the various elements of your network fabric, looking for inconsistencies in configuration across your fabric, connectivity faults, missing configuration, and so forth, and then and display the results for your assessment. They can be run from any node in the network.

### Validate the Network Fabric

You can validate the following network fabric elements:

```
cumulus@switch:/$ netq check
    agents      :  Netq agent
    bgp         :  BGP info
    cl-version  :  Cumulus Linux version
```

```
    clag       :  Cumulus Multi-chassis LAG
    evpn       :  EVPN
    interfaces :  network interface port
    license    :  License information
    lnv        :  Lightweight Network Virtualization info
    mtu        :  Link MTU
    ntp        :  NTP
    ospf       :  OSPF info
    sensors    :  Temperature/Fan/PSU sensors
    vlan       :  VLAN
    vxlan      :  VXLAN data path
```

For example, to determine the status of BGP running on your network:

```
cumulus@switch:~$ netq check bgp
Total Nodes: 15, Failed Nodes: 0, Total Sessions: 16, Failed Sessions: 0
```

You can see from this output that NetQ has validated the connectivity and configuration of BGP across all of the nodes in the network and found them all to be operating properly. If there were issues with any of the nodes, NetQ would provide information about each node to aid in resolving the issues.

There is a check command for each of the supported fabric elements. They all behave in a similar manner, checking for connectivity, configuration, and other problems, indicating the number of nodes that they have checked and indicating the number that have failed.

Some additional examples—

Validate that EVPN is running correctly on all nodes:

```
cumulus@switch:~$ netq check evpn
Total Nodes: 15, Failed Nodes: 0, Total Sessions: 0, Failed Sessions: 0, Total VNIs: 0
```

Confirm all monitored nodes are running the NetQ Agent:

```
cumulus@switch:~$ netq check agents
Checked nodes: 25, Rotten nodes: 1
Hostname        Status        Last Changed
----------------- ---------------- -------------------------
leaf01          Rotten        8d:13h:34m:51s
```

Validate that all corresponding interface links have matching MTUs. The first shows no mismatches, the second shows an error.

```
cumulus@switch:~$ netq check mtu
Checked Nodes: 15, Checked Links: 138, Failed Nodes: 0, Failed Links: 0
No MTU Mismatch found

cumulus@switch:~$ netq check mtu
Checked Nodes: 13, Checked Links: 173, Failed Nodes: 1, Failed Links: 1
MTU mismatch found on following links
Hostname        Interface            MTU    Peer          Peer Interface        Peer
MTU Error
```

```
---------------- ------------------------ ------ ---------------- ------------------------ -------- ---------------
leaf01           -                        -      -                -                        -        Rotten Agent
```

Validate that VXLANs are configured and operating properly:

```
cumulus@switch:~$ netq check vxlan
Checked Nodes: 6, Warning Nodes: 0, Failed Nodes: 6
Nodes with error
Hostname         Reason
---------------- ----------------------------------------------------------------
exit01           inconsistent replication list for vni 104001
exit02           inconsistent replication list for vni 104001
leaf01           inconsistent replication list for vni 104001
leaf02           inconsistent replication list for vni 104001
leaf03           inconsistent replication list for vni 104001
leaf04           inconsistent replication list for vni 104001
```

TIP

Both asymmetric and symmetric VXLAN configurations are validated with this command.

You can be more granular in your validation as well, using the additional options available for each of the check commands. For example, validate BGP operation for nodes communicating over a particular VRF:

```
cumulus@switch:~$ netq check bgp vrf DataVrf1081
Total Nodes: 25, Failed Nodes: 1, Total Sessions: 52 , Failed Sessions: 1
Hostname          VRF             Peer Name         Peer Hostname
Reason                                        Last Changed
----------------- --------------- ----------------- ----------------- ---------------------------------------------
-------------------------
exit-1            DataVrf1081     swp7.3            firewall-2        BGP session with peer
firewall-2 (swp7.3 vrf  1d:5h:47m:31s
                                                    DataVrf1081) failed,
                                                    reason: Peer not configured
```

Each of the check commands provides a starting point for troubleshooting configuration and connectivity issues within your network in real time. They provide an additional option of viewing the network state at an earlier time, using the `around` option.

For example, if you were notified of an issue on your VLANs that appears to have occurred about 10 minutes ago, you could run:

```
cumulus@switch:~$ netq check vlan around 10m
Checked Nodes: 15, Checked Links: 138, Failed Nodes: 0, Failed Links: 0
No VLAN or PVID Mismatch found
```

## Validate Device Status and Configuration

You can validate the following device elements:

- NTP

- Sensors
- License

It is always important to have your devices in time synchronization to ensure configuration and management events can be tracked and correlations can be made between events. To validate time synchronization, run:

```
cumulus@switch:~$ netq check ntp
Total Nodes: 15, Checked Nodes: 15, Rotten Nodes: 0, Unknown Nodes: 0, failed
NTP Nodes: 8
Hostname         NTP Sync Connect Time
----------------- -------- -------------------------
exit01           no       2018-09-12 16:30:39
exit02           no       2018-09-12 16:30:45
leaf01           no       2018-09-12 16:30:43
leaf02           no       2018-09-12 16:30:36
leaf03           no       2018-09-12 16:30:36
leaf04           no       2018-09-12 16:30:34
spine01          no       2018-09-12 16:30:44
spine02          no       2018-09-12 16:30:40
```

This example shows eight nodes that are not in time synchronization. You can now continue to investigate these nodes, validating that the NetQ Agents are active, whether an NTP server has become unreachable, and so forth.

Hardware platforms have a number sensors to provide environmental data about the switches. Knowing these are all within range is a good check point for maintenance. For example, if you had a temporary HVAC failure and you are concerned that some of your nodes are beginning to overheat, you can run:

```
cumulus@switch:~$ netq check sensors
Total Nodes: 25, Failed Nodes: 0, Checked Sensors: 221, Failed Sensors: 0
```

You can also check for any nodes that have invalid licenses without going to each node. Because switches do not operate correctly without a valid license you might want to verify that your Cumulus Linux licenses on a regular basis:

```
cumulus@switch:~$ netq check license
Total Nodes: 15, Failed Nodes: 0, Checked Licenses: 10, Failed Licenses: 0
```

> TIP
>
> This command checks every node, meaning every switch and host in the network. Hosts do not require a Cumulus Linux license, so the number of licenses checked might be smaller than the total number of nodes checked.

### Validate Interface Status and Configuration

As with other `netq check` commands, you can validate the proper operation of your interfaces across the network:

```
cumulus@switch:~$ netq check interfaces
Checked Nodes: 15, Failed Nodes: 8
Checked Ports: 118, Failed Ports: 8, Unverified Ports: 94
Hostname         Interface                 Peer Hostname     Peer Interface            Message
---------------- ------------------------- ----------------- -------------------------
```

```
-----------------------------------
leaf01      swp7        firewall02   swp3        Speed mismatch
(10G, n/a),
                                     Autoneg mismatch (off, n/a)
leaf02      swp2        server02     eth2        Autoneg mismatch
(off, on)
leaf03      swp1        server03     eth1        Autoneg mismatch
(off, on)
leaf04      swp2        server04     eth2        Autoneg mismatch
(off, on)
server01    eth1        leaf01       swp1        Autoneg mismatch
(on, off)
server02    eth2        leaf02       swp2        Autoneg mismatch
(on, off)
server03    eth1        leaf03       swp1        Autoneg mismatch
(on, off)
server04    eth2        leaf04       swp2        Autoneg mismatch
(on, off)
```

When failures are seen, additional information is provided to start your investigation. In this example, some reconfiguration is required for auto-negotiation with peer interfaces.

### Create Filters for Provisioning Exceptions

With this release, you are able to configure filters to change validation errors to warnings that would normally occur due to the default expectations of the `netq check` commands. This applies to all protocols and services, except for Agents and LNV. For example, if you have provisioned BGP with configurations where a BGP peer is not expected or desired, you will get errors that a BGP peer is missing. By creating a filter, you can remove the error in favor of a warning.

To create a validation filter:

1. Navigate to the */etc/netq* directory.
2. Create or open the *check_filter.yml* file using your text editor of choice.

   This file contains the syntax to follow to create one or more rules for one or more protocols or services. Create your own rules, and/or edit and un-comment any example rules you would like to use.

```
# Netq check result filter rule definition file.  This is for filtering
# results based on regex match on one or more columns of each test result.
# Currently, only action 'filter' is supported. Each test can have one or
# more rules, and each rule can match on one or more columns.  In addition,
# rules can also be optionally defined under the 'global' section and will
# apply to all tests of a check.
#
# syntax:
#
# <check name>:
#   tests:
#     <test name, as shown in test list when using the include/exclude and tab>:
#       - rule:
#           match:
#             <column name>: regex
#             <more columns and regex.., result is AND>
#           action:
#             filter
```

```
#      - <more rules..>
#   global:
#     - rule:
#         . . .
#     - rule:
#         . . .
#
# <another check name>:
#   . . .
#
# e.g.
#
# bgp:
#   tests:
#     Address Families:
#       - rule:
#           match:
#             Hostname: (^exit*|^firewall)
#             VRF: DataVrf1080
#             Reason: AFI/SAFI evpn not activated on peer
#           action:
#             filter
#       - rule:
#           match:
#             Hostname: exit-2
#             Reason: SAFI evpn not activated on peer
#           action:
#             filter
#     Router ID:
```

```
#      - rule:
#          match:
#            Hostname: exit-2
#          action:
#            filter
#
# evpn:
#   tests:
#     EVPN Type 2:
#      - rule:
#          match:
#            Hostname: exit-1
#          action:
#            filter
#
```

## View Network Details

The `netq show` commands display a wide variety of content about the network and its various elements. You can show content for the following:

```
cumulus@switch:~$ netq show
    agents       :  Netq agent
    bgp          :  BGP info
    clag         :  Cumulus Multi-chassis LAG
    events       :  Display changes over time
    evpn         :  EVPN
    interfaces   :  network interface port
```

```
    inventory     :  Inventory information
    ip            :  IPv4 related info
    ipv6          :  IPv6 related info
    kubernetes    :  Kubernetes Information
    lldp          :  LLDP based neighbor info
    lnv           :  Lightweight Network Virtualization info
    macs          :  Mac table or MAC address info
    notification  :  Send notifications to Slack or PagerDuty
    ntp           :  NTP
    ospf          :  OSPF info
    sensors       :  Temperature/Fan/PSU sensors
    services      :  System services
    vlan          :  VLAN
    vxlan         :  VXLAN data path
```

For example, to validate the the status of the NetQ agents running in the fabric, run `netq show agents`. A *Fresh* status indicates the Agent is running as expected. The Agent sends a heartbeat every 30 seconds, and if three consecutive heartbeats are missed, its status changes to *Rotten*.

```
cumulus@switch:~$ netq show agents
Matching agents records:
Hostname          Status           NTP Sync Version                              Sys Uptime
Agent Uptime              Reinitialize Time          Last Changed
----------------- ---------------- -------- ------------------------------------ -------------------------
------------------------- ------------------------- -------------------------
exit01            Fresh            yes      2.3.0-cl3u21~1569246310.30858c3      1d:21h:30m:
19s          1d:21h:30m:9s           1d:21h:30m:9s            Tue Sep 24 22:45:03 2019
```

```
exit02 Fresh yes 2.3.0-cl3u21~1569246310.30858c3 1d:21h:32m:1s 1d:21h:31m:51s 1d:21h:31m:51s Tue Sep 24 22:43:35 2019
leaf01 Fresh yes 2.3.0-cl3u21~1569246310.30858c3 1d:21h:31m:14s 1d:21h:31m:5s 1d:21h:31m:5s Tue Sep 24 22:44:25 2019
leaf02 Fresh yes 2.3.0-cl3u21~1569246310.30858c3 1d:21h:31m:57s 1d:21h:31m:47s 1d:21h:31m:47s Tue Sep 24 22:44:20 2019
leaf03 Fresh yes 2.3.0-cl3u21~1569246310.30858c3 1d:21h:31m:4s 1d:21h:30m:55s 1d:21h:30m:55s Tue Sep 24 22:44:19 2019
leaf04 Fresh yes 2.3.0-cl3u21~1569246310.30858c3 1d:21h:32m:37s 1d:21h:32m:28s 1d:21h:32m:28s Tue Sep 24 22:43:05 2019
server01 Fresh no 2.3.0-ub18.04u21~1569246309.30858c3 1d:21h:10m:50s 1d:21h:10m:38s 1d:21h:10m:38s Tue Sep 24 22:49:10 2019
server02 Fresh yes 2.3.0-ub18.04u21~1569246309.30858c3 1d:21h:10m:50s 1d:21h:10m:38s 1d:21h:10m:38s Wed Sep 25 18:35:44 2019
server03 Fresh yes 2.3.0-ub18.04u21~1569246309.30858c3 1d:21h:10m:50s 1d:21h:10m:38s 1d:21h:10m:38s Wed Sep 25 15:37:10 2019
server04 Fresh yes 2.3.0-ub18.04u21~1569246309.30858c3 1d:21h:10m:49s 1d:21h:10m:37s 1d:21h:10m:37s Tue Sep 24 22:49:33 2019
spine01 Fresh yes 2.3.0-cl3u21~1569246310.30858c3 1d:21h:30m:10s 1d:21h:30m:1s 1d:21h:30m:1s Tue Sep 24 22:44:40 2019
spine02 Fresh yes 2.3.0-cl3u21~1569246310.30858c3 1d:21h:30m:16s 1d:21h:30m:6s 1d:21h:30m:6s Tue Sep 24 22:43:32 2019
```

Some additional examples follow.

View the status of BGP:

```
cumulus@switch:~$ netq show bgp
Hostname          Neighbor                     VRF             ASN        Peer ASN   PfxRx        Last
Changed
----------------- --------------------------- --------------- ---------- ---------- ------------
------------------------
exit01            swp44(internet)              vrf1            65041      25253      2/-/-        Fri Apr
19 16:00:40 2019
exit01            swp51(spine01)               default         65041      65020      8/-/59       Fri
Apr 19 16:00:40 2019
exit01            swp52(spine02)               default         65041      65020      8/-/59       Fri
Apr 19 16:00:40 2019
exit02            swp44(internet)              vrf1            65042      25253      7/-/-        Fri Apr
19 16:00:40 2019
exit02            swp51(spine01)               default         65042      65020      8/-/59       Fri
Apr 19 16:00:40 2019
exit02            swp52(spine02)               default         65042      65020      8/-/59       Fri
Apr 19 16:00:40 2019
leaf01            peerlink.4094(leaf02)        default         65011      65011      9/-/34       Fri
Apr 19 16:00:40 2019
leaf01            swp51(spine01)               default         65011      65020      6/-/34       Fri
Apr 19 16:00:40 2019
leaf01            swp52(spine02)               default         65011      65020      6/-/34       Fri
Apr 19 16:00:40 2019
leaf02            peerlink.4094(leaf01)        default         65011      65011      9/-/34       Fri
Apr 19 16:00:40 2019
leaf02            swp51(spine01)               default         65011      65020      6/-/34       Fri
Apr 19 16:00:40 2019
```

```
leaf02        swp52(spine02)         default      65011     65020     6/-/34     Fri
Apr 19 16:00:40 2019
leaf03        peerlink.4094(leaf04)     default      65012     65012     9/-/34     Fri
Apr 19 16:00:40 2019
leaf03        swp51(spine01)         default      65012     65020     6/-/34     Fri
Apr 19 16:00:40 2019
leaf03        swp52(spine02)         default      65012     65020     6/-/34     Fri
Apr 19 16:00:40 2019
leaf04        peerlink.4094(leaf03)     default      65012     65012     9/-/34     Fri
Apr 19 16:00:40 2019
leaf04        swp51(spine01)         default      65012     65020     6/-/34     Fri
Apr 19 16:00:40 2019
leaf04        swp52(spine02)         default      65012     65020     6/-/34     Fri
Apr 19 16:00:40 2019
spine01        swp1(leaf01)         default      65020     65011     3/-/14     Fri
Apr 19 16:00:40 2019
spine01        swp2(leaf02)         default      65020     65011     3/-/14     Fri
Apr 19 16:00:40 2019
spine01        swp29(exit02)         default      65020     65042     1/-/3      Fri
Apr 19 16:00:40 2019
spine01        swp3(leaf03)         default      65020     65012     3/-/14     Fri
Apr 19 16:00:40 2019
spine01        swp30(exit01)         default      65020     65041     1/-/3      Fri
Apr 19 16:00:40 2019
spine01        swp4(leaf04)         default      65020     65012     3/-/14     Fri
Apr 19 16:00:40 2019
spine02        swp1(leaf01)         default      65020     65011     3/-/12     Fri
Apr 19 16:00:40 2019
spine02        swp2(leaf02)         default      65020     65011     3/-/12     Fri
```

```
Apr 19 16:00:40 2019
spine02          swp29(exit02)          default      65020     65042     1/-/3      Fri
Apr 19 16:00:40 2019
spine02          swp3(leaf03)           default      65020     65012     3/-/12     Fri
Apr 19 16:00:40 2019
spine02          swp30(exit01)          default      65020     65041     1/-/3      Fri
Apr 19 16:00:40 2019
spine02          swp4(leaf04)           default      65020     65012     3/-/12     Fri
Apr 19 16:00:40 2019
```

View the status of your VLANs:

```
cumulus@switch:~$ netq show vlan
Matching vlan records:
Hostname         VLANs                    SVIs                      Last Changed
---------------- ------------------------ ------------------------ ------------------------
server11         1                                                  Thu Feb  7 00:17:48 2019
server21         1                                                  Thu Feb  7 00:17:48 2019
server11         1                                                  Thu Feb  7 00:17:48 2019
server13         1                                                  Thu Feb  7 00:17:48 2019
server21         1                                                  Thu Feb  7 00:17:48 2019
server23         1                                                  Thu Feb  7 00:17:48 2019
leaf01           100-106,1000-1009        100-106 1000-1009         Thu Feb  7 00:17:49
2019
leaf02           100-106,1000-1009        100-106 1000-1009         Thu Feb  7 00:17:49
2019
leaf11           100-106,1000-1009        100-106 1000-1009         Thu Feb  7 00:17:49
2019
```

```
leaf12          100-106,1000-1009       100-106 1000-1009       Thu Feb  7 00:17:50
2019
leaf21          100-106,1000-1009       100-106 1000-1009       Thu Feb  7 00:17:50
2019
leaf22          100-106,1000-1009       100-106 1000-1009       Thu Feb  7 00:17:50
2019
```

View the status of the hardware sensors:

```
cumulus@switch:~$ netq show sensors all

Matching sensors records:
Hostname        Name            Description                     State
Message                         Last Changed
----------------- --------------- ----------------------------------- ---------- -----------------------------------
-------------------------
exit01          fan1            fan tray 1, fan 1               ok                                      Wed
Feb  6 23:02:35 2019
exit01          fan2            fan tray 1, fan 2               ok                                      Wed
Feb  6 23:02:35 2019
exit01          fan3            fan tray 2, fan 1               ok                                      Wed
Feb  6 23:02:35 2019
exit01          fan4            fan tray 2, fan 2               ok                                      Wed
Feb  6 23:02:35 2019
exit01          fan5            fan tray 3, fan 1               ok                                      Wed
Feb  6 23:02:35 2019
exit01          fan6            fan tray 3, fan 2               ok                                      Wed
Feb  6 23:02:35 2019
```

```
exit01           psu1fan1       psu1 fan                    ok                                             Wed
Feb  6 23:02:35 2019
exit01           psu2fan1       psu2 fan                    ok                                             Wed
Feb  6 23:02:35 2019
exit02           fan1           fan tray 1, fan 1           ok                                             Wed
Feb  6 23:03:35 2019
exit02           fan2           fan tray 1, fan 2           ok                                             Wed
Feb  6 23:03:35 2019
exit02           fan3           fan tray 2, fan 1           ok                                             Wed
Feb  6 23:03:35 2019
exit02           fan4           fan tray 2, fan 2           ok                                             Wed
Feb  6 23:03:35 2019
exit02           fan5           fan tray 3, fan 1           ok                                             Wed
Feb  6 23:03:35 2019
exit02           fan6           fan tray 3, fan 2           ok                                             Wed
Feb  6 23:03:35 2019
exit02           psu1fan1       psu1 fan                    ok                                             Wed
Feb  6 23:03:35 2019
exit02           psu2fan1       psu2 fan                    ok                                             Wed
Feb  6 23:03:35 2019
leaf01           fan1           fan tray 1, fan 1           ok                                             Wed
Feb  6 23:01:12 2019
leaf01           fan2           fan tray 1, fan 2           ok                                             Wed
Feb  6 23:01:12 2019
leaf01           fan3           fan tray 2, fan 1           ok                                             Wed
Feb  6 23:01:12 2019
leaf01           fan4           fan tray 2, fan 2           ok                                             Wed
Feb  6 23:01:12 2019
leaf01           fan5           fan tray 3, fan 1           ok                                             Wed
```

```
Feb  6 23:01:12 2019
leaf01          fan6         fan tray 3, fan 2              ok                                      Wed
Feb  6 23:01:12 2019
leaf01          psu1fan1       psu1 fan                     ok                                      Wed
Feb  6 23:01:12 2019
leaf01          psu2fan1       psu2 fan                     ok                                      Wed
Feb  6 23:01:12 2019
leaf02          fan1         fan tray 1, fan 1              ok                                      Wed
Feb  6 22:59:54 2019
leaf02          fan2         fan tray 1, fan 2              ok                                      Wed
Feb  6 22:59:54 2019
leaf02          fan3         fan tray 2, fan 1              ok                                      Wed
Feb  6 22:59:54 2019
leaf02          fan4         fan tray 2, fan 2              ok                                      Wed
Feb  6 22:59:54 2019
leaf02          fan5         fan tray 3, fan 1              ok                                      Wed
Feb  6 22:59:54 2019
...
```

# Monitor Switch Hardware and Software

With NetQ, a network administrator can monitor both the switch hardware and software components for misconfigurations. NetQ helps answer questions such as:

- What switches do I have in the network?
- What hardware and software are installed on my switches?
- How many transmit and receive packets have been dropped?
- Are all switches licensed correctly?
- Do all switches have NetQ agents running?

NetQ uses LLDP (Link Layer Discovery Protocol) to collect port information. NetQ can also identify peer ports connected to DACs (Direct Attached Cables) and AOCs (Active Optical Cables) without using LLDP, even if the link is not UP.

The NetQ CLI provides the `netq show inventory`, `netq show sensors`, and `netq show events` commands to monitor switches.

## Monitor Switch and Host Hardware Information

You can view summary information about all switches and hosts along with their key components, including the motherboard, ASIC, microprocessor, disk and memory information.

To view the switch and host information with the CLI, use the following `netq show` commands:

```
netq [<hostname>] show inventory brief [opta] [json]
netq [<hostname>] show inventory asic [vendor <asic-vendor>|model <asic-model>|model-id <asic-model-id>] [opta] [json]
netq [<hostname>] show inventory board [vendor <board-vendor>|model <board-model>] [opta] [json]
netq [<hostname>] show inventory cpu [arch <cpu-arch>] [opta] [json]
netq [<hostname>] show inventory disk [name <disk-name>|transport <disk-transport>|vendor <disk-vendor>] [opta] [json]
netq [<hostname>] show inventory license [cumulus] [status ok | status missing] [around <text-time>] [opta] [json]
netq [<hostname>] show inventory memory [type <memory-type>|vendor <memory-vendor>] [opta] [json]
netq [<hostname>] show inventory os [version <os-version>|name <os-name>] [opta] [json]

netq [<hostname>] show sensors all [around <text-time>] [json]
netq [<hostname>] show sensors psu [<psu-name>] [around <text-time>] [json]
netq [<hostname>] show sensors temp [<temp-name>] [around <text-time>] [json]
netq [<hostname>] show sensors fan [<fan-name>] [around <text-time>] [json]

netq [<hostname>] show events [level info | level error | level warning | level critical | level debug] [type sensors] [between <text-time> and <text-endtime>] [json]
```

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- w: week(s)
- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the <text-time> is the most recent time and the <text-endtime> is the oldest time. The values do not have to have the same unit of measure.

NOTE

The keyword values for the vendor, model, model-id, arch, name, transport, type, version, psu, temp, and fan keywords are specific to your deployment. For example, if you have devices with CPU architectures of only one type, say Intel x86, then that is the only option available for the cpu-arch keyword value. If you have multiple CPU architectures, say you also have ARMv7, then that would also be an option for you.

To view the switch and host information with the GUI, use the Devices Inventory card workflow which contains a small card with a count of each device type in your network, a medium card displaying the operating systems running on each set of devices, large cards with component information statistics, and full-screen cards displaying tables with attributes of all switches and all hosts in your network.

### View a Summary of Your Network Inventory

While the detail can be very helpful, sometimes a simple overview of the hardware inventory is better. This example shows the basic hardware information for all devices.

```
cumulus@switch:~$ netq show inventory brief

Matching inventory records:
Hostname          Switch               OS              CPU      ASIC            Ports
----------------- -------------------- --------------- -------- --------------- -----------------------------------
edge01            N/A                  Ubuntu          x86_64   N/A             N/A
exit01            VX                   CL              x86_64   VX              N/A
exit02            VX                   CL              x86_64   VX              N/A
leaf01            VX                   CL              x86_64   VX              N/A
leaf02            VX                   CL              x86_64   VX              N/A
leaf03            VX                   CL              x86_64   VX              N/A
leaf04            VX                   CL              x86_64   VX              N/A
server01          N/A                  Ubuntu          x86_64   N/A             N/A
server02          N/A                  Ubuntu          x86_64   N/A             N/A
server03          N/A                  Ubuntu          x86_64   N/A             N/A
server04          N/A                  Ubuntu          x86_64   N/A             N/A
spine01           VX                   CL              x86_64   VX              N/A
spine02           VX                   CL              x86_64   VX              N/A
```

View Information about the ASIC on all Switches

You can view the vendor, model, model identifier, core bandwidth capability, and ports of the ASIC installed on your switch motherboard. This example shows all of these for all devices.

```
cumulus@switch:~$ netq show inventory asic
Matching inventory records:
Hostname        Vendor           Model                    Model ID             Core
BW        Ports
----------------- -------------------- ------------------------------ ------------------------- --------------
----------------------------------
dell-z9100-05     Broadcom          Tomahawk                 BCM56960
2.0T          32 x 100G-QSFP28
mlx-2100-05       Mellanox          Spectrum                 MT52132              N/
A           16 x 100G-QSFP28
mlx-2410a1-05     Mellanox          Spectrum                 MT52132              N/
A           48 x 25G-SFP28 & 8 x 100G-QSFP28
mlx-2700-11       Mellanox          Spectrum                 MT52132              N/
A           32 x 100G-QSFP28
qct-ix1-08        Broadcom          Tomahawk                 BCM56960
2.0T          32 x 100G-QSFP28
qct-ix7-04        Broadcom          Trident3                 BCM56870             N/
A           32 x 100G-QSFP28
qct-ix7-04        N/A               N/A                      N/A                  N/A          N/A
st1-l1            Broadcom          Trident2                 BCM56854             720G
48 x 10G-SFP+ & 6 x 40G-QSFP+
st1-l2            Broadcom          Trident2                 BCM56854             720G
48 x 10G-SFP+ & 6 x 40G-QSFP+
```

```
st1-l3          Broadcom         Trident2                 BCM56854              720G
48 x 10G-SFP+ & 6 x 40G-QSFP+
st1-s1          Broadcom         Trident2                 BCM56850              960G
32 x 40G-QSFP+
st1-s2          Broadcom         Trident2                 BCM56850              960G
32 x 40G-QSFP+
```

You can filter the results of the command to view devices with a particular characteristic. This example shows all devices that use a Broadcom ASIC.

```
cumulus@switch:~$ netq show inventory asic vendor Broadcom
Matching inventory records:
Hostname         Vendor             Model                        Model ID              Core
BW       Ports
----------------- -------------------- ----------------------------- ------------------------- --------------
----------------------------------
dell-z9100-05     Broadcom          Tomahawk                   BCM56960
2.0T          32 x 100G-QSFP28
qct-ix1-08       Broadcom          Tomahawk                   BCM56960
2.0T          32 x 100G-QSFP28
qct-ix7-04       Broadcom          Trident3                   BCM56870              N/
A          32 x 100G-QSFP28
st1-l1          Broadcom         Trident2                 BCM56854              720G
48 x 10G-SFP+ & 6 x 40G-QSFP+
st1-l2          Broadcom         Trident2                 BCM56854              720G
48 x 10G-SFP+ & 6 x 40G-QSFP+
st1-l3          Broadcom         Trident2                 BCM56854              720G
48 x 10G-SFP+ & 6 x 40G-QSFP+
```

```
st1-s1         Broadcom          Trident2               BCM56850              960G
32 x 40G-QSFP+
st1-s2         Broadcom          Trident2               BCM56850              960G
32 x 40G-QSFP+
```

You can filter the results of the command view the ASIC information for a particular switch. This example shows the ASIC information for *st1-11* switch.

```
cumulus@switch:~$ netq leaf02 show inventory asic
Matching inventory records:
Hostname        Vendor            Model                    Model ID              Core BW
  Ports
----------------- -------------------- ----------------------------- ------------------------ --------------
----------------------------------
st1-l1         Broadcom          Trident2               BCM56854              720G
48 x 10G-SFP+ & 6 x 40G-QSFP+
```

### View Information about the Motherboard in a Switch

You can view the vendor, model, base MAC address, serial number, part number, revision, and manufacturing date for a switch motherboard on a single device or on all devices. This example shows all of the motherboard data for all devices.

```
cumulus@switch:~$ netq show inventory board
Matching inventory records:
Hostname        Vendor            Model                    Base MAC         Serial No
       Part No          Rev     Mfg Date
```

```
---------------- ------------------- ---------------------------- ----------------- -----------------------
--------------- ------ ----------
dell-z9100-05     DELL              Z9100-ON                  4C:76:25:E7:42:C0
CN03GT5N779315C20001     03GT5N        A00    12/04/2015
mlx-2100-05      Penguin           Arctica 1600cs              7C:FE:90:F5:61:C0
MT1623X10078           MSN2100-CB2FO    N/A    06/09/2016
mlx-2410a1-05     Mellanox           SN2410                    EC:0D:9A:4E:55:C0
MT1734X00067           MSN2410-CB2F_QP3 N/A    08/24/2017
mlx-2700-11      Penguin           Arctica 3200cs              44:38:39:00:AB:80
MT1604X21036           MSN2700-CS2FO    N/A    01/31/2016
qct-ix1-08       QCT              QuantaMesh BMS T7032-IX1      54:AB:3A:78:69:51
QTFCO7623002C          1IX1UZZ0ST6      H3B    05/30/2016
qct-ix7-04       QCT              IX7                       D8:C4:97:62:37:65
QTFCUW821000A          1IX7UZZ0ST5      B3D    05/07/2018
qct-ix7-04       QCT              T7032-IX7                  D8:C4:97:62:37:65
QTFCUW821000A          1IX7UZZ0ST5      B3D    05/07/2018
st1-l1          CELESTICA         Arctica 4806xp              00:E0:EC:27:71:37
D2060B2F044919GD000011    R0854-F1004-01   Redsto 09/20/2014
                                                                  ne-XP
st1-l2          CELESTICA         Arctica 4806xp              00:E0:EC:27:6B:3A
D2060B2F044919GD000060    R0854-F1004-01   Redsto 09/20/2014
                                                                  ne-XP
st1-l3          Penguin           Arctica 4806xp              44:38:39:00:70:49  N/A
    N/A           N/A    N/A
st1-s1          Dell              S6000-ON                  44:38:39:00:80:00  N/A
 N/A            N/A    N/A
st1-s2          Dell              S6000-ON                  44:38:39:00:80:81  N/A
 N/A            N/A    N/A
```

You can filter the results of the command to capture only those devices with a particular motherboard vendor. This example shows only the devices with *Celestica* motherboards.

```
cumulus@switch:~$ netq show inventory board vendor celestica
Matching inventory records:
Hostname          Vendor               Model                          Base MAC             Serial No
     Part No           Rev    Mfg Date
----------------- -------------------- ------------------------------ ------------------ -------------------------
---------------- ------ ----------
st1-l1            CELESTICA            Arctica 4806xp                 00:E0:EC:27:71:37
D2060B2F044919GD000011    R0854-F1004-01   Redsto 09/20/2014
                                                                                           ne-XP
st1-l2            CELESTICA            Arctica 4806xp                 00:E0:EC:27:6B:3A
D2060B2F044919GD000060    R0854-F1004-01   Redsto 09/20/2014
                                                                                           ne-XP
```

You can filter the results of the command to view the model for a particular switch. This example shows the motherboard vendor for the *st1-s1* switch.

```
cumulus@switch:~$ netq st1-s1 show inventory board
Matching inventory records:
Hostname          Vendor               Model                          Base MAC             Serial No
     Part No           Rev    Mfg Date
----------------- -------------------- ------------------------------ ------------------ -------------------------
---------------- ------ ----------
st1-s1            Dell                 S6000-ON                       44:38:39:00:80:00  N/A
 N/A              N/A    N/A
```

View Information about the CPU on a Switch

You can view the architecture, model, operating frequency, and the number of cores for the CPU on a single device or for all devices. This example shows these CPU characteristics for all devices.

```
cumulus@nswitch:~$ netq show inventory cpu
Matching inventory records:
Hostname         Arch     Model                        Freq       Cores
---------------- -------- ---------------------------- ---------- -----
dell-z9100-05     x86_64   Intel(R) Atom(TM) C2538       2.40GHz    4
mlx-2100-05       x86_64   Intel(R) Atom(TM) C2558       2.40GHz    4
mlx-2410a1-05     x86_64   Intel(R) Celeron(R)  1047UE    1.40GHz    2
mlx-2700-11       x86_64   Intel(R) Celeron(R)  1047UE    1.40GHz    2
qct-ix1-08        x86_64   Intel(R) Atom(TM) C2558       2.40GHz    4
qct-ix7-04        x86_64   Intel(R) Atom(TM) C2558       2.40GHz    4
st1-l1            x86_64   Intel(R) Atom(TM) C2538       2.41GHz    4
st1-l2            x86_64   Intel(R) Atom(TM) C2538       2.41GHz    4
st1-l3            x86_64   Intel(R) Atom(TM) C2538       2.40GHz    4
st1-s1            x86_64   Intel(R) Atom(TM)  S1220      1.60GHz    4
st1-s2            x86_64   Intel(R) Atom(TM)  S1220      1.60GHz    4
```

You can filter the results of the command to view which switches employ a particular CPU architecture using the *arch* keyword. This example shows how to determine which architectures are deployed in your network, and then shows all devices with an *x86_64* architecture.

```
cumulus@switch:~$ netq show inventory cpu arch
    x86_64  :  CPU Architecture

cumulus@switch:~$ netq show inventory cpu arch x86_64
Matching inventory records:
Hostname          Arch     Model                          Freq       Cores
----------------- -------- ------------------------------ ---------- -----
leaf01            x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
leaf02            x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
leaf03            x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
leaf04            x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
oob-mgmt-server   x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
server01          x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
server02          x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
server03          x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
server04          x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
spine01           x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
spine02           x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
```

You can filter the results to view CPU information for a single switch, as shown here for *server02*.

```
cumulus@switch:~$ netq server02 show inventory cpu

Matching inventory records:
Hostname          Arch     Model                          Freq       Cores
----------------- -------- ------------------------------ ---------- -----
server02          x86_64   Intel Core i7 9xx (Nehalem Cla N/A        1
                           ss Core i7)
```

### View Information about the Disk on a Switch

You can view the name or operating system, type, transport, size, vendor, and model of the disk on a single device or all devices. This example shows all of these disk characteristics for all devices.

```
cumulus@switch:~$ netq show inventory disk
Matching inventory records:
Hostname          Name            Type             Transport          Size       Vendor
Model
----------------- --------------- ---------------- ------------------ ---------- --------------------
------------------------------
leaf01            vda             disk             N/A                6G         0x1af4               N/A
leaf02            vda             disk             N/A                6G         0x1af4               N/A
leaf03            vda             disk             N/A                6G         0x1af4               N/A
leaf04            vda             disk             N/A                6G         0x1af4               N/A
oob-mgmt-server   vda             disk             N/A                256G       0x1af4               N/A
```

```
server01      vda       disk       N/A            301G     0x1af4          N/A
server02      vda       disk       N/A            301G     0x1af4          N/A
server03      vda       disk       N/A            301G     0x1af4          N/A
server04      vda       disk       N/A            301G     0x1af4          N/A
spine01       vda       disk       N/A            6G       0x1af4          N/A
spine02       vda       disk       N/A            6G       0x1af4          N/A
```

You can filter the results of the command to view the disk information for a particular device. This example shows disk information for *leaf03* switch.

```
cumulus@switch:~$ netq leaf03 show inventory disk
Matching inventory records:
Hostname        Name        Type        Transport       Size      Vendor
Model
---------------- --------------- ---------------- ------------------ ---------- --------------------
------------------------------
leaf03        vda        disk        N/A            6G       0x1af4          N/A
```

### View Memory Information for a Switch

You can view the name, type, size, speed, vendor, and serial number for the memory installed in a single device or all devices. This example shows all of these characteristics for all devices.

```
cumulus@switch:~$ netq show inventory memory
Matching inventory records:
Hostname        Name        Type        Size     Speed      Vendor           Serial No
```

```
----------------- --------------- ---------------- ---------- ---------- -------------------- -------------------------
dell-z9100-05     DIMM0 BANK 0    DDR3          8192 MB    1600 MHz
Hynix             14391421
mlx-2100-05       DIMM0 BANK 0    DDR3          8192 MB    1600 MHz   InnoDisk
Corporation 00000000
mlx-2410a1-05     ChannelA-DIMM0  DDR3          8192 MB    1600 MHz
017A              87416232
                  BANK 0
mlx-2700-11       ChannelA-DIMM0  DDR3          8192 MB    1600 MHz
017A              73215444
                  BANK 0
mlx-2700-11       ChannelB-DIMM0  DDR3          8192 MB    1600 MHz
017A              73215444
                  BANK 2
qct-ix1-08        N/A             N/A           7907.45MB  N/A        N/A                  N/A
qct-ix7-04        DIMM0 BANK 0    DDR3          8192 MB    1600 MHz
Transcend         00211415
st1-l1            DIMM0 BANK 0    DDR3          4096 MB    1333 MHz   N/A                  N/A
st1-l2            DIMM0 BANK 0    DDR3          4096 MB    1333 MHz   N/A                  N/A
st1-l3            DIMM0 BANK 0    DDR3          4096 MB    1600 MHz   N/A                  N/A
st1-s1            A1_DIMM0 A1_BAN DDR3          8192 MB    1333 MHz
A1_Manufacturer0     A1_SerNum0
                  K0
st1-s2            A1_DIMM0 A1_BAN DDR3          8192 MB    1333 MHz
A1_Manufacturer0     A1_SerNum0
                  K0
```

You can filter the results of the command to view devices with a particular memory type or vendor. This example shows all of the devices with memory from *QEMU* .

```
cumulus@switch:~$ netq show inventory memory vendor QEMU
Matching inventory records:
Hostname          Name            Type             Size       Speed      Vendor               Serial No
----------------- --------------- ---------------- ---------- ---------- -------------------- -------------------------
leaf01            DIMM 0          RAM              1024 MB    Unknown    QEMU                 Not Specified
leaf02            DIMM 0          RAM              1024 MB    Unknown    QEMU                 Not Specified
leaf03            DIMM 0          RAM              1024 MB    Unknown    QEMU                 Not Specified
leaf04            DIMM 0          RAM              1024 MB    Unknown    QEMU                 Not Specified
oob-mgmt-server   DIMM 0          RAM              4096 MB    Unknown    QEMU                 Not Specified
server01          DIMM 0          RAM              512 MB     Unknown    QEMU                 Not Specified
server02          DIMM 0          RAM              512 MB     Unknown    QEMU                 Not Specified
server03          DIMM 0          RAM              512 MB     Unknown    QEMU                 Not Specified
server04          DIMM 0          RAM              512 MB     Unknown    QEMU                 Not Specified
spine01           DIMM 0          RAM              1024 MB    Unknown    QEMU                 Not Specified
spine02           DIMM 0          RAM              1024 MB    Unknown    QEMU                 Not Specified
```

You can filter the results to view memory information for a single switch, as shown here for leaf01.

```
cumulus@switch:~$ netq leaf01 show inventory memory

Matching inventory records:
Hostname          Name            Type             Size       Speed      Vendor               Serial No
----------------- --------------- ---------------- ---------- ---------- -------------------- -------------------------
leaf01            DIMM 0          RAM              1024 MB    Unknown    QEMU                 Not
Specified
```

### View a Summary of Physical Inventory for the NetQ or NetQ Cloud Appliance

Using the `opta` option lets you view inventory information for the NetQ or NetQ Cloud Appliance(s) rather than all network nodes. This example give you a summary of the inventory on the device.

```
cumulus@spine-1:mgmt-vrf:~$ netq show inventory brief opta

Matching inventory records:
Hostname          Switch               OS              CPU      ASIC            Ports
----------------- -------------------- --------------- -------- --------------- -----------------------------------
10-20-14-158      VX                   CL              x86_64   VX              N/A
```

### View Memory for the NetQ or NetQ Cloud Appliance

You can be specific about which inventory item you want to view for an appliance. This example shows the memory information for a NetQ Appliance, letting you verify you have sufficient memory.

```
cumulus@netq-appliance:~$ netq show inventory memory opta
Matching inventory records:
Hostname          Name            Type             Size       Speed      Vendor               Serial No
----------------- --------------- ---------------- ---------- ---------- -------------------- -------------------------
netq-app          DIMM 0          RAM              64 GB      Unknown    QEMU                 Not Specified
```

### View Fan Health for All Switches

Fan, power supply unit, and temperature sensors are available to provide additional data about the NetQ Platform operation. To view the health of fans in your switches, use the `netq show sensors fan` command. If you name the fans in all of your switches consistently, you can view more information at once.

In this example, we look at the state of all fans with the name *fan1*.

```
cumulus@switch:~$ netq show sensors fan fan1
Hostname          Name            Description                         State      Speed      Max      Min      Message                           Last Changed
----------------- --------------- ----------------------------------- ---------- ---------- -------- -------- --------------------------------- -------------------------
exit01            fan1            fan tray 1, fan 1                   ok         2500       29000
```

```
2500                    Fri Apr 19 16:01:17 2019
exit02      fan1       fan tray 1, fan 1         ok       2500      29000
2500                    Fri Apr 19 16:01:33 2019
leaf01      fan1       fan tray 1, fan 1         ok       2500      29000
2500                    Sun Apr 21 20:07:12 2019
leaf02      fan1       fan tray 1, fan 1         ok       2500      29000
2500                    Fri Apr 19 16:01:41 2019
leaf03      fan1       fan tray 1, fan 1         ok       2500      29000
2500                    Fri Apr 19 16:01:44 2019
leaf04      fan1       fan tray 1, fan 1         ok       2500      29000
2500                    Fri Apr 19 16:01:36 2019
spine01      fan1       fan tray 1, fan 1         ok       2500      29000
2500                    Fri Apr 19 16:01:52 2019
spine02      fan1       fan tray 1, fan 1         ok       2500      29000
2500                    Fri Apr 19 16:01:08 2019
```

TIP

Use tab completion to determine the names of the fans in your switches:

```
cumulus@switch:~$ netq show sensors fan <<press tab>>
  around : Go back in time to around ...
  fan1 : Fan Name
  fan2 : Fan Name
  fan3 : Fan Name
  fan4 : Fan Name
  fan5 : Fan Name
  fan6 : Fan Name
  json : Provide output in JSON
  psu1fan1 : Fan Name
  psu2fan1 : Fan Name
  <ENTER>
```

To view the status for a particular switch, use the optional `hostname` parameter.

```
cumulus@switch:~$ netq leaf01 show sensors fan fan1
Hostname          Name            Description                         State      Speed      Max
Min      Message                             Last Changed
----------------- --------------- ----------------------------------- ---------- ---------- -------- --------
----------------------------------- -------------------------
```

```
leaf01          fan1          fan tray 1, fan 1          ok      2500      29000
2500                    Sun Apr 21 20:07:12 2019
```

### View PSU Health for All Switches

Fan, power supply unit, and temperature sensors are available to provide additional data about the NetQ Platform operation. To view the health of PSUs in your switches, use the `netq show sensors psu` command. If you name the PSUs in all of your switches consistently, you can view more information at once.

In this example, we look at the state of all PSUs with the name *psu2*.

```
cumulus@switch:~$ netq show sensors psu psu2
Matching sensors records:
Hostname        Name        State     Message                     Last Changed
---------------- -------------- ---------- -------------------------------- ------------------------
exit01          psu2          ok                                  Fri Apr 19 16:01:17 2019
exit02          psu2          ok                                  Fri Apr 19 16:01:33 2019
leaf01          psu2          ok                                  Sun Apr 21 20:07:12 2019
leaf02          psu2          ok                                  Fri Apr 19 16:01:41 2019
leaf03          psu2          ok                                  Fri Apr 19 16:01:44 2019
leaf04          psu2          ok                                  Fri Apr 19 16:01:36 2019
spine01          psu2          ok                                  Fri Apr 19 16:01:52 2019
spine02          psu2          ok                                  Fri Apr 19 16:01:08 2019
```

TIP

Use Tab completion to determine the names of the PSUs in your switches. Use the optional hostname parameter to view the PSU state for a given switch.

### View the Temperature in All switches

Fan, power supply unit, and temperature sensors are available to provide additional data about the NetQ Platform operation. To view the temperature sensor status, current temperature, and configured threshold values, use the netq show sensors temp command. If you name the temperature sensors in all of your switches consistently, you can view more information at once.

In this example, we look at the state of all temperature sensors with the name *psu1temp1*.

```
cumulus@switch:~$ netq show sensors temp psu2temp1
Matching sensors records:
Hostname          Name            Description                         State      Temp     Critical
Max      Min      Message                             Last Changed

----------------- --------------- ----------------------------------- ---------- -------- -------- -------- --------
----------------------------------- -------------------------

exit01            psu2temp1       psu2 temp sensor                    ok         25       85       80
 5                                Fri Apr 19 16:01:17 2019

exit02            psu2temp1       psu2 temp sensor                    ok         25       85       80
 5                                Fri Apr 19 16:01:33 2019
```

```
leaf01          psu2temp1     psu2 temp sensor          ok      25     85     80
  5                          Sun Apr 21 20:07:12 2019

leaf02          psu2temp1     psu2 temp sensor          ok      25     85     80
  5                          Fri Apr 19 16:01:41 2019

leaf03          psu2temp1     psu2 temp sensor          ok      25     85     80
  5                          Fri Apr 19 16:01:44 2019

leaf04          psu2temp1     psu2 temp sensor          ok      25     85     80
  5                          Fri Apr 19 16:01:36 2019

spine01          psu2temp1     psu2 temp sensor          ok      25     85     80
  5                          Fri Apr 19 16:01:52 2019

spine02          psu2temp1     psu2 temp sensor          ok      25     85     80
  5                          Fri Apr 19 16:01:08 2019
```

TIP

Use Tab completion to determine the names of the temperature sensors in your switches. Use the optional `hostname` parameter to view the temperature state, current temperature, and threshold values for a given switch.

### View All Sensor Data

To view all fan data, all PSU data, or all temperature data from the sensors, you must view all of the sensor data. The more consistently you name your sensors, the easier it will be to view the full sensor data.

```
cumulus@switch:~$ netq show sensors all
Matching sensors records:
Hostname          Name            Description                         State      Message                             Last Changed
----------------- --------------- ----------------------------------- ---------- ----------------------------------- -------------------------
exit01            fan1            fan tray 1, fan 1                   ok                                             Fri Apr 19 16:01:17 2019
exit01            fan2            fan tray 1, fan 2                   ok                                             Fri Apr 19 16:01:17 2019
exit01            fan3            fan tray 2, fan 1                   ok                                             Fri Apr 19 16:01:17 2019
exit01            fan4            fan tray 2, fan 2                   ok                                             Fri Apr 19 16:01:17 2019
exit01            fan5            fan tray 3, fan 1                   ok                                             Fri Apr 19 16:01:17 2019
exit01            fan6            fan tray 3, fan 2                   ok                                             Fri Apr 19 16:01:17 2019
exit01            psu1fan1        psu1 fan                            ok                                             Fri Apr 19 16:01:17 2019
exit01            psu1temp1       psu1 temp sensor                    ok                                             Fri Apr 19 16:01:17 2019
exit01            psu2fan1        psu2 fan                            ok                                             Fri
```

```
Apr 19 16:01:17 2019
exit01          psu2temp1      psu2 temp sensor                ok
  Fri Apr 19 16:01:17 2019
exit01          temp1          board sensor near cpu           ok
  Fri Apr 19 16:01:17 2019
exit01          temp2          board sensor near virtual switch    ok
        Fri Apr 19 16:01:17 2019
exit01          temp3          board sensor at front left corner   ok
      Fri Apr 19 16:01:17 2019
exit01          temp4          board sensor at front right corner  ok
        Fri Apr 19 16:01:17 2019
exit01          temp5          board sensor near fan           ok
Fri Apr 19 16:01:17 2019
exit02          fan1           fan tray 1, fan 1               ok                              Fri
Apr 19 16:01:33 2019
exit02          fan2           fan tray 1, fan 2               ok                              Fri
Apr 19 16:01:33 2019
exit02          fan3           fan tray 2, fan 1               ok                              Fri
Apr 19 16:01:33 2019
exit02          fan4           fan tray 2, fan 2               ok                              Fri
Apr 19 16:01:33 2019
exit02          fan5           fan tray 3, fan 1               ok                              Fri
Apr 19 16:01:33 2019
exit02          fan6           fan tray 3, fan 2               ok                              Fri
Apr 19 16:01:33 2019
exit02          psu1fan1       psu1 fan                        ok                              Fri
Apr 19 16:01:33 2019
exit02          psu1temp1      psu1 temp sensor                ok
```

```
  Fri Apr 19 16:01:33 2019
...
```

### View All Sensor-related Events

You can view the events that are triggered by the sensors using the `netq show events` command. You can narrow the focus to only critical events using the severity `level` option.

```
cumulus@switch:~$ netq show events type sensors
No matching events records found

cumulus@switch:~$ netq show events level critical type sensors
No matching events records found
```

### View Interface Statistics and Utilization

NetQ Agents collect performance statistics every 30 seconds for the physical interfaces on switches and hosts in your network. The NetQ Agent does not collect statistics for non-physical interfaces, such as bonds, bridges, and VXLANs. The NetQ Agent collects the following statistics:

- Statistics
  - **Transmit**: tx_bytes, tx_carrier, tx_colls, tx_drop, tx_errs, tx_packets
  - **Receive**: rx_bytes, rx_drop, rx_errs, rx_frame, rx_multicast, rx_packets
- Utilization
  - rx_util, tx_util
  - port speed

These can be viewed using the following NetQ CLI commands:

```
netq [<hostname>] show interface-stats [errors | all] [<physical-port>] [around
<text-time>] [json]
netq [<hostname>] show interface-utils [<text-port>] [tx|rx] [around <text-time>]
[json]
```

Where the various options are:

- `hostname` limits the output to a particular switch
- `errors` limits the output to only the transmit and receive errors found on the designated interfaces
- `physical-port` limits the output to a particular port
- `around` enables viewing of the data at a time in the past
- `json` outputs results in json format
- `text-port` limits output to a particular host and port; `hostname` is required with this option
- `tx`, `rx` limits output to the transmit or receive values, respectively

In this example, we view the interface statistics for all switches and all of their physical interfaces.

```
cumulus@switch:~$ netq show interface-stats
Matching proc_dev_stats records:
Hostname        Interface               Duration       RX Bytes          RX Drop          RX
Errors          TX Bytes          TX Drop          TX Errors         Last Changed
---------------- ------------------------ ---------------- -------------------- --------------------
-------------------- -------------------- -------------------- -------------------- -------------------------
edge01          eth0                    30             2278              0                16
4007            0                 0                Mon Jun  3 23:03:14 2019
```

```
edge01          lo                  30             864               0                 0
864             0               0                 Mon Jun  3 23:03:14 2019
exit01          bridge              60             336               0                 0
1176            0               0                 Mon Jun  3 23:02:27 2019
exit01          eth0                30             3424              0                 0
6965            0               0                 Mon Jun  3 23:02:58 2019
exit01          mgmt                30             2682              0                 0
7488            0               0                 Mon Jun  3 23:02:58 2019
exit01          swp44               30             2457              0                 0
2457            0               0                 Mon Jun  3 23:02:58 2019
exit01          swp51               30             2462              0                 0
1769            0               0                 Mon Jun  3 23:02:58 2019
exit01          swp52               30             2634              0                 0
2629            0               0                 Mon Jun  3 23:02:58 2019
exit01          vlan4001            50             336               0                 0
1176            0               0                 Mon Jun  3 23:02:27 2019
exit01          vrf1                60             1344              0                 0
0               0               0                 Mon Jun  3 23:02:27 2019
exit01          vxlan4001           50             336               0                 0
1368            0               0                 Mon Jun  3 23:02:27 2019
exit02          bridge              61             1008              0                 0
392             0               0                 Mon Jun  3 23:03:07 2019
exit02          eth0                20             2711              0                 0
4983            0               0                 Mon Jun  3 23:03:07 2019
exit02          mgmt                30             2162              0                 0
5506            0               0                 Mon Jun  3 23:03:07 2019
exit02          swp44               20             3040              0                 0
3824            0               0                 Mon Jun  3 23:03:07 2019
...
```

In this example, we view the interface statistics for switch port 29.

```
cumulus@switch:~$ netq show interface-stats swp29
Matching proc_dev_stats records:
Hostname         Interface                  RX Bytes             RX Drop              RX Errors
TX Bytes             TX Drop              TX Errors            Last Updated
----------------- ------------------------ -------------------- -------------------- --------------------
-------------------- -------------------- -------------------- ------------------------
spine01          swp29                      12853778             0                    0
13281292             0                    0                    Wed Sep 25 14:43:17 2019
spine02          swp29                      11739987             0                    0
13316634             0                    0                    Wed Sep 25 14:43:32 2019
```

In this example, we view the utilization for the leaf03 switch.

```
cumulus@switch:~$ netq leaf03 show interface-utils
Matching port_stats records:
Hostname         Interface                  RX Bytes             RX Drop              RX Errors
RX Util              TX Bytes             TX Drop              TX Errors            TX Util              Port
Speed            Last Changed
----------------- ------------------------ -------------------- -------------------- --------------------
-------------------- -------------------- -------------------- -------------------- --------------------
-------------------- --------------------
leaf03           bond03                     4447                 0                    0                    0
5041                 0                    0                    0                    NA                   Wed Sep 25
14:46:16
```

```
2019
leaf03          bond04              3811            0               0               0
4957              0               0               0               NA              Wed Sep 25
14:46:16

2019
leaf03          bridge              540             0               0               0
476               0               0               0               NA              Wed Sep 25
14:46:16

2019
leaf03          eth0                3471            0               0
0.00033102        10480             0               0               0.000999451
1G                Wed Sep 25 14:46:16

2019
...
```

In this example, we view the transmit utilization only.

```
cumulus@switch:~$ netq show interface-utils tx
Matching port_stats records:
Hostname          Interface                TX Bytes             TX Drop              TX Errors
TX Util            Port Speed           Last Changed
----------------- ------------------------ -------------------- -------------------- --------------------
-------------------- -------------------- --------------------
exit01          bridge              784             0               0               0
NA                Wed Sep 25 14:48:10
```

```
2019
exit01      eth0        7497       0        0
0.00071497     1G        Wed Sep 25 14:48:10

2019
exit01      lo        0        0        0        0
NA        Mon Sep 23 22:45:38

2019
exit01      mgmt        8014       0        0        0
NA        Wed Sep 25 14:48:10

2019
exit01      swp1        0        0        0        0
Unknown       Mon Sep 23 22:45:38

2019
...
```

### View SSD Utilization

For NetQ servers and appliances that have 3ME3 solid state drives (SSDs) installed (primarily in on-premises deployments), you can view the utilization of the drive on-demand. An alarm is generated for drives that drop below 10% health, or have more than a two percent loss of health in 24 hours, indicating the need to rebalance the drive. Tracking SSD utilization over time enables you to see any downward trend or instability of the drive before you receive an alarm.

Use the `netq-cl-ssd-util` command to view the SSD information.

This example shows the utilization for spine02 which has this type of SSD.

```
cumulus@switch:~$ netq spine02 show cl-ssd-util
Hostname        Remaining PE Cycle (%)  Current PE Cycles executed      Total PE
Cycles supported       SSD Model           Last Changed
spine02         80                 576                  2880                M.2 (S42)
3ME3        Thu Oct 31 00:15:06 2019
```

This output indicates that this drive is in a good state overall with 80% of its PE cycles remaining. View this information for all devices with this type of SSD by removing the `hostname` option, or add the `around` option to view this information around a particular time.

### View Disk Storage Utilization After BTRFS Allocation

Customers running Cumulus Linux 3.x which uses the BTRFS (b-tree file system) might experience issues with disk space management. This is a known problem of BTRFS because it does not perform periodic garbage collection, or rebalancing. If left unattended, these errors can make it impossible to rebalance the partitions on the disk. To avoid this issue, Cumulus Networks recommends rebalancing the BTRFS partitions in a preemptive manner, but only when absolutely needed to avoid reduction in the lifetime of the disk. By tracking the state of the disk space usage, users can determine when rebalancing should be performed. Refer to When to Rebalance BTRFS Partitions for details about the rules used to recommend a rebalance operation.

To view the disk utilization and whether a rebalance is recommended, use the `netq show cl-btrfs-util` command as follows:

```
cumulus@switch:~$ netq show cl-btrfs-info
Matching btrfs_info records:
Hostname          Device Allocated     Unallocated Space    Largest Chunk Size
Unused Data Chunks S Rebalance Recommende Last Changed
                                                pace              d
----------------- -------------------- -------------------- -------------------- --------------------
-------------------- -------------------------
exit01            31.16 %              3.96 GB              588.5 MB             39.13 MB
no                   Wed Oct 30 18:51:35 2019
exit02            31.16 %              3.96 GB              588.5 MB             38.79 MB
no                   Wed Oct 30 19:20:41 2019
leaf01            31.16 %              3.96 GB              588.5 MB             38.75 MB
no                   Wed Oct 30 18:52:34 2019
leaf02            31.16 %              3.96 GB              588.5 MB             38.79 MB
no                   Wed Oct 30 18:51:22 2019
leaf03            31.16 %              3.96 GB              588.5 MB             35.44 MB
no                   Wed Oct 30 18:52:02 2019
leaf04            31.16 %              3.96 GB              588.5 MB             33.49 MB
no                   Wed Oct 30 19:21:15 2019
spine01            31.16 %              3.96 GB              588.5 MB             36.9 MB
no                   Wed Oct 30 19:21:13 2019
spine02            31.16 %              3.96 GB              588.5 MB             39.12 MB
no                   Wed Oct 30 18:52:44 2019
```

Look for the **Rebalance Recommended** column. If the value in that column says *Yes*, then you are strongly encouraged to rebalance the BTRFS partitions. If it says *No*, then you can review the other values in the output to determine if you are getting close to needing a rebalance, and come back to view this data at a later time.

Optionally, use the `hostname` option to view the information for a given device, or use the `around` option to view the information for a particular time.

## Monitor Switch Software Information

The syntax for the commands is:

```
netq [<hostname>] show agents
netq [<hostname>] show inventory brief [json]
netq [<hostname>] show inventory license [cumulus] [status ok|status missing]
[around <text-time>] [json]
netq [<hostname>] show inventory os [version <os-version>|name <os-name>]
[json]
netq [<hostname>] show events [level info|level error|level warning|level critical|
level debug] [type license|type os] [between <text-time> and <text-endtime>]
[json]
```

NOTE

The values for the `name` option are specific to your deployment. For example, if you have devices with only one type of OS, say Cumulus Linux, then that is the only option available for the `os-name` option value. If you have multiple OSs running, say you also have Ubuntu, then that would also be an option for you.

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- w: week(s)
- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the `<text-time>` is the most recent time and the `<text-endtime>` is the oldest time. The values do not have to have the same unit of measure.

### View OS Information for a Switch

You can view the name and version of the OS on a switch, and when it was last modified. This example shows the OS information for all devices.

```
cumulus@switch:~$ netq show inventory os
Matching inventory records:
Hostname          Name            Version                              Last Changed
----------------- --------------- ------------------------------------ -------------------------
edge01            Ubuntu          16.04                                Fri Apr 19 16:01:18 2019
exit01            CL              3.7.5                                Fri Apr 19 16:01:13 2019
exit02            CL              3.7.5                                Fri Apr 19 16:01:38 2019
```

```
leaf01            CL           3.7.5                      Sun Apr 21 20:07:09 2019
leaf02            CL           3.7.5                      Fri Apr 19 16:01:46 2019
leaf03            CL           3.7.5                      Fri Apr 19 16:01:41 2019
leaf04            CL           3.7.5                      Fri Apr 19 16:01:32 2019
server01          Ubuntu       16.04                      Fri Apr 19 16:01:55 2019
server02          Ubuntu       16.04                      Fri Apr 19 16:01:55 2019
server03          Ubuntu       16.04                      Fri Apr 19 16:01:55 2019
server04          Ubuntu       16.04                      Fri Apr 19 16:01:55 2019
spine01           CL           3.7.5                      Fri Apr 19 16:01:49 2019
spine02           CL           3.7.5                      Fri Apr 19 16:01:05 2019
```

You can filter the results of the command to view only devices with a particular operating system or version. This can be especially helpful when you suspect that a particular device has not been upgraded as expected. This example shows all devices with the Cumulus Linux version 3.7.5 installed.

```
cumulus@switch:~$ netq show inventory os version 3.7.5
Matching inventory records:
Hostname        Name        Version                         Last Changed
---------------- --------------- ---------------------------------- ------------------------
exit01          CL          3.7.5                           Fri Apr 19 16:01:13 2019
exit02          CL          3.7.5                           Fri Apr 19 16:01:38 2019
leaf01          CL          3.7.5                           Sun Apr 21 20:07:09 2019
leaf02          CL          3.7.5                           Fri Apr 19 16:01:46 2019
leaf03          CL          3.7.5                           Fri Apr 19 16:01:41 2019
leaf04          CL          3.7.5                           Fri Apr 19 16:01:32 2019
spine01         CL          3.7.5                           Fri Apr 19 16:01:49 2019
spine02         CL          3.7.5                           Fri Apr 19 16:01:05 2019
```

This example shows changes that have been made to the OS on all devices between 16 and 21 days ago. Remember to use measurement units on the time values.

```
cumulus@switch:~$ netq show events type os between 16d and 21d
Matching inventory records:
Hostname        Name        Version                         DB State   Last Changed
---------------- --------------- ---------------------------------- ---------- ------------------------
mlx-2410a1-05    Cumulus Linux   3.7.3                      Add       Tue Feb 12
18:30:53 2019
mlx-2700-11      Cumulus Linux   3.7.3                      Add       Tue Feb 12
18:30:45 2019
mlx-2100-05      Cumulus Linux   3.7.3                      Add       Tue Feb 12
18:30:26 2019
mlx-2100-05      Cumulus Linux   3.7.3~1533263174.bce9472        Add       Wed
```

```
Feb 13 11:10:47 2019
mlx-2700-11     Cumulus Linux   3.7.3~1533263174.bce9472        Add      Wed
Feb 13 11:10:38 2019
mlx-2100-05     Cumulus Linux   3.7.3~1533263174.bce9472        Add      Wed
Feb 13 11:10:42 2019
mlx-2700-11     Cumulus Linux   3.7.3~1533263174.bce9472        Add      Wed
Feb 13 11:10:51 2019
```

### View License Information for a Switch

You can view the name and current state of the license (whether it valid or not), and when it was last updated for one or more devices. If a license is no longer valid on a switch, it does not operate correctly. This example shows the license information for all devices.

```
cumulus@switch:~$ netq show inventory license

Matching inventory records:
Hostname          Name            State      Last Changed
----------------- --------------- ---------- ------------------------
edge01            Cumulus Linux   N/A        Fri Apr 19 16:01:18 2019
exit01            Cumulus Linux   ok         Fri Apr 19 16:01:13 2019
exit02            Cumulus Linux   ok         Fri Apr 19 16:01:38 2019
leaf01            Cumulus Linux   ok         Sun Apr 21 20:07:09 2019
leaf02            Cumulus Linux   ok         Fri Apr 19 16:01:46 2019
leaf03            Cumulus Linux   ok         Fri Apr 19 16:01:41 2019
leaf04            Cumulus Linux   ok         Fri Apr 19 16:01:32 2019
server01          Cumulus Linux   N/A        Fri Apr 19 16:01:55 2019
server02          Cumulus Linux   N/A        Fri Apr 19 16:01:55 2019
```

```
server03        Cumulus Linux   N/A      Fri Apr 19 16:01:55 2019
server04        Cumulus Linux   N/A      Fri Apr 19 16:01:55 2019
spine01         Cumulus Linux   ok       Fri Apr 19 16:01:49 2019
spine02         Cumulus Linux   ok       Fri Apr 19 16:01:05 2019
```

You can view the historical state of licenses using the around keyword. This example shows the license state for all devices about 7 days ago. Remember to use measurement units on the time values.

```
cumulus@switch:~$ netq show inventory license around 7d

Matching inventory records:
Hostname          Name            State      Last Changed
----------------- --------------- ---------- -------------------------
edge01            Cumulus Linux   N/A        Tue Apr 2 14:01:18 2019
exit01            Cumulus Linux   ok         Tue Apr 2 14:01:13 2019
exit02            Cumulus Linux   ok         Tue Apr 2 14:01:38 2019
leaf01            Cumulus Linux   ok         Tue Apr 2 20:07:09 2019
leaf02            Cumulus Linux   ok         Tue Apr 2 14:01:46 2019
leaf03            Cumulus Linux   ok         Tue Apr 2 14:01:41 2019
leaf04            Cumulus Linux   ok         Tue Apr 2 14:01:32 2019
server01          Cumulus Linux   N/A        Tue Apr 2 14:01:55 2019
server02          Cumulus Linux   N/A        Tue Apr 2 14:01:55 2019
server03          Cumulus Linux   N/A        Tue Apr 2 14:01:55 2019
server04          Cumulus Linux   N/A        Tue Apr 2 14:01:55 2019
spine01           Cumulus Linux   ok         Tue Apr 2 14:01:49 2019
spine02           Cumulus Linux   ok         Tue Apr 2 14:01:05 2019
```

You can filter the results to show license changes during a particular timeframe for a particular device. This example shows that there have been no changes to the license state on spine01 between now and 24 hours ago.

```
cumulus@switch:~$ netq spine01 show events type license between now and 24h
No matching events records found
```

### View Summary of Operating System on a Switch

As with the hardware information, you can view a summary of the software information using the brief keyword. Specify a hostname to view the summary for a specific device.

```
cumulus@switch:~$ netq show inventory brief

Matching inventory records:
Hostname         Switch               OS              CPU      ASIC            Ports
---------------- -------------------- --------------- -------- --------------- -----------------------------------
edge01           N/A                  Ubuntu          x86_64   N/A             N/A
exit01           VX                   CL              x86_64   VX              N/A
exit02           VX                   CL              x86_64   VX              N/A
leaf01           VX                   CL              x86_64   VX              N/A
leaf02           VX                   CL              x86_64   VX              N/A
leaf03           VX                   CL              x86_64   VX              N/A
leaf04           VX                   CL              x86_64   VX              N/A
server01         N/A                  Ubuntu          x86_64   N/A             N/A
server02         N/A                  Ubuntu          x86_64   N/A             N/A
server03         N/A                  Ubuntu          x86_64   N/A             N/A
server04         N/A                  Ubuntu          x86_64   N/A             N/A
```

```
spine01         VX              CL          x86_64   VX          N/A
spine02         VX              CL          x86_64   VX          N/A
```

### View All Software Packages Installed on Switches

If you are having an issue with a particular switch, you may want to verify what software is installed and whether it needs updating. Use the `netq show cl-pkg-info` command to view this information.

This example shows all installed software packages for *spine01*.

```
cumulus@switch:~$ netq spine01 show cl-pkg-info

Matching package_info records:
Hostname          Package Name          Version          CL Version          Package
Status       Last Changed
----------------- ------------------------ -------------------- -------------------- --------------------
------------------------
spine01         adduser              3.113+nmu3          Cumulus Linux 3.7.8
installed          Wed Oct 30 18:21:05 2019
spine01         apt                  1.0.9.8.2-cl3u3     Cumulus Linux 3.7.8
installed          Wed Oct 30 18:21:05 2019
spine01         arping               2.14-1              Cumulus Linux 3.7.8  installed
Wed Oct 30 18:21:05 2019
spine01         base-files           8+deb8u11           Cumulus Linux 3.7.8
installed          Wed Oct 30 18:21:05 2019
spine01         busybox              1:1.22.0-9+deb8u4   Cumulus Linux 3.7.8
installed          Wed Oct 30 18:21:05 2019
spine01         clag                 1.3.0-cl3u23        Cumulus Linux 3.7.8  installed
```

```
Wed Oct 30 18:21:05 2019
spine01     cumulus-chassis     0.1-cl3u4     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     cumulus-platform     3.0-cl3u28     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     dh-python     1.20141111-2     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     dialog     1.2-20140911-1     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     discover     2.1.2-7     Cumulus Linux 3.7.8  installed
Wed Oct 30 18:21:05 2019
spine01     discover-data     2.2013.01.11     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     dmidecode     2.12-3     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     dnsutils     1:9.9.5.dfsg-9+deb8u Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
                    18
spine01     e2fslibs     1.42.12-2+b1     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     e2fsprogs     1.42.12-2+b1     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     eject     2.1.5+deb1+cvs200811 Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
                    04-13.1+deb8u1
spine01     ethtool     1:4.6-1-cl3u7     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
spine01     gcc-4.9-base     4.9.2-10+deb8u2     Cumulus Linux 3.7.8
installed     Wed Oct 30 18:21:05 2019
```

```
spine01        gnupg              1.4.18-7+deb8u5     Cumulus Linux 3.7.8
installed       Wed Oct 30 18:21:05 2019
...
```

Remove the hostname option to view the information for all switches. Use the text-package-name option to narrow the results to a particular package or the around option to narrow the output to a particular time range.

### Validate NetQ Agents are Running

You can confirm that NetQ Agents are running on switches and hosts (if installed) using the netq show agents command. Viewing the **Status** column of the output indicates whether the agent is up and current, labelled *Fresh*, or down and stale, labelled *Rotten*. Additional information is provided about the agent status, including whether it is time synchronized, how long it has been up, and the last time its state changed.

This example shows NetQ Agent state on all devices.

```
cumulus@switch:~$ netq show agents
Matching agents records:
Hostname        Status          NTP Sync Version                          Sys Uptime
Agent Uptime            Reinitialize Time         Last Changed
----------------- ---------------- -------- ------------------------------------ -------------------------
------------------------- ------------------------- -------------------------
edge01          Fresh          yes      2.1.0-ub16.04u15~1555612152.6e34b56  2d:7h:
2m:12s          2d:7h:2m:5s           2d:7h:2m:5s            Sun Apr 21 16:00:50 2019
exit01          Fresh          yes      2.1.0-cl3u15~1555612272.6e34b56      2d:7h:1m:
30s          2d:7h:1m:22s           2d:7h:1m:22s            Sun Apr 21 16:00:52 2019
exit02          Fresh          yes      2.1.0-cl3u15~1555612272.6e34b56      2d:7h:1m:
```

```
36s          2d:7h:1m:27s          2d:7h:1m:27s          Sun Apr 21 16:01:19 2019
leaf01          Fresh          yes     2.1.0-cl3u15~1555612272.6e34b56      2d:7h:1m:
28s          2h:54m:12s          2h:54m:12s          Sun Apr 21 20:05:45 2019
leaf02          Fresh          yes     2.1.0-cl3u15~1555612272.6e34b56      2d:7h:1m:
38s          2d:7h:1m:29s          2d:7h:1m:29s          Sun Apr 21 16:01:43 2019
leaf03          Fresh          yes     2.1.0-cl3u15~1555612272.6e34b56      2d:7h:1m:
37s          2d:7h:1m:28s          2d:7h:1m:28s          Sun Apr 21 16:01:23 2019
leaf04          Fresh          yes     2.1.0-cl3u15~1555612272.6e34b56      2d:7h:1m:
39s          2d:7h:1m:31s          2d:7h:1m:31s          Sun Apr 21 16:01:27 2019
server01          Fresh          yes     2.1.0-ub16.04u15~1555612152.6e34b56  2d:6h:
59m:35s          2d:6h:59m:27s          2d:6h:59m:27s          Sun Apr 21 16:00:43
2019
server02          Fresh          yes     2.1.0-ub16.04u15~1555612152.6e34b56  2d:6h:
59m:34s          2d:6h:59m:26s          2d:6h:59m:26s          Sun Apr 21 16:00:46
2019
server03          Fresh          yes     2.1.0-ub16.04u15~1555612152.6e34b56  2d:6h:
59m:34s          2d:6h:59m:26s          2d:6h:59m:26s          Sun Apr 21 16:00:52
2019
server04          Fresh          yes     2.1.0-ub16.04u15~1555612152.6e34b56  2d:6h:
59m:34s          2d:6h:59m:26s          2d:6h:59m:26s          Sun Apr 21 16:00:43
2019
spine01          Fresh          yes     2.1.0-cl3u15~1555612272.6e34b56      2d:7h:1m:
40s          2d:7h:1m:32s          2d:7h:1m:32s          Sun Apr 21 16:01:33 2019
spine02          Fresh          yes     2.1.0-cl3u15~1555612272.6e34b56      2d:7h:1m:
34s          2d:7h:1m:26s          2d:7h:1m:26s          Sun Apr 21 16:01:12 2019
```

You can narrow your focus in several ways:

- View the state of the NetQ Agent on a given device using the *hostname* keyword.
- View only the NetQ Agents that are fresh or rotten using the *fresh* or *rotten* keyword.
- View the state of NetQ Agents at an earlier time using the *around* keyword.

## Monitor Software Services

Cumulus Linux and NetQ run a number of services to deliver the various features of these products. You can monitor their status using the `netq show services` command. The services related to system-level operation are described here. Monitoring of other services, such as those related to routing, are described with those topics. NetQ automatically monitors the following services:

- **bgpd**: BGP (Border Gateway Protocol) daemon
- **clagd**: MLAG (Multi-chassis Link Aggregation) daemon
- **helpledmgrd**: Switch LED manager daemon
- **lldpd**: LLDP (Link Layer Discovery Protocol) daemon
- **mstpd**: MSTP (Multiple Spanning Tree Protocol) daemon
- **neighmgrd**: Neighbor Manager daemon for BGP and OSPF
- **netq-agent**: NetQ Agent service
- **netqd**: NetQ application daemon
- **ntp**: NTP service
- **ntpd**: NTP daemon
- **ptmd**: PTM (Prescriptive Topology Manager) daemon
- **pwmd**: PWM (Password Manager) daemon
- **rsyslog**: Rocket-fast system event logging processing service
- **smond**: System monitor daemon
- **ssh**: Secure Shell service for switches and servers

- **status**: License validation service
- **syslog**: System event logging service
- **vrf**: VRF (Virtual Route Forwarding) service
- **zebra**: GNU Zebra routing daemon

The CLI syntax for viewing the status of services is:

```
netq [<hostname>] show services [<service-name>] [vrf <vrf>] [active|monitored]
[around <text-time>] [json]
netq [<hostname>] show services [<service-name>] [vrf <vrf>] status (ok|warning|
error|fail) [around <text-time>] [json]
netq [<hostname>] show events [level info | level error | level warning | level
critical | level debug] type services [between <text-time> and <text-endtime>]
[json]
```

### View All Services on All Devices

This example shows all of the available services on each device and whether each is enabled, active, and monitored, along with how long the service has been running and the last time it was changed.

TIP

It is useful to have colored output for this show command. To configure colored output, run the `netq config add color` command.

```
cumulus@switch:~$ netq show services
Hostname         Service          PID   VRF          Enabled Active Monitored
Status         Uptime              Last Changed
---------------- ------------------- ----- -------------- ------- ------ --------- ----------------
------------------------ ------------------------
leaf01         bgpd             2872  default      yes    yes   yes     ok          1d:6h:
43m:59s        Fri Feb 15 17:28:24 2019
leaf01         clagd            n/a   default      yes    no    yes     n/a         1d:6h:
43m:35s        Fri Feb 15 17:28:48 2019
leaf01         ledmgrd          1850  default      yes    yes   no      ok          1d:6h:
43m:59s        Fri Feb 15 17:28:24 2019
leaf01         lldpd            2651  default      yes    yes   yes     ok          1d:6h:
43m:27s        Fri Feb 15 17:28:56 2019
leaf01         mstpd            1746  default      yes    yes   yes     ok          1d:6h:
43m:35s        Fri Feb 15 17:28:48 2019
leaf01         neighmgrd        1986  default      yes    yes   no      ok          1d:
6h:43m:59s         Fri Feb 15 17:28:24 2019
leaf01         netq-agent       8654  mgmt         yes    yes   yes     ok          1d:
6h:43m:29s         Fri Feb 15 17:28:54 2019
leaf01         netqd            8848  mgmt         yes    yes   yes     ok          1d:6h:
43m:29s        Fri Feb 15 17:28:54 2019
leaf01         ntp              8478  mgmt         yes    yes   yes     ok          1d:6h:
43m:29s        Fri Feb 15 17:28:54 2019
leaf01         ptmd             2743  default      yes    yes   no      ok          1d:6h:
43m:59s        Fri Feb 15 17:28:24 2019
leaf01         pwmd             1852  default      yes    yes   no      ok          1d:6h:
43m:59s        Fri Feb 15 17:28:24 2019
leaf01         smond            1826  default      yes    yes   yes     ok          1d:6h:
43m:27s        Fri Feb 15 17:28:56 2019
```

```
leaf01      ssh         2106  default     yes   yes   no     ok         1d:6h:
43m:59s      Fri Feb 15 17:28:24 2019
leaf01      syslog       8254  default     yes   yes   no     ok         1d:6h:
43m:59s      Fri Feb 15 17:28:24 2019
leaf01      zebra        2856  default     yes   yes   yes    ok         1d:6h:
43m:59s      Fri Feb 15 17:28:24 2019
leaf02      bgpd         2867  default     yes   yes   yes    ok         1d:6h:
43m:55s      Fri Feb 15 17:28:28 2019
leaf02      clagd        n/a   default     yes   no    yes    n/a        1d:6h:
43m:31s      Fri Feb 15 17:28:53 2019
leaf02      ledmgrd       1856  default     yes   yes   no     ok         1d:6h:
43m:55s      Fri Feb 15 17:28:28 2019
leaf02      lldpd        2646  default     yes   yes   yes    ok         1d:6h:
43m:30s      Fri Feb 15 17:28:53 2019
...
```

You can also view services information in JSON format:

```
cumulus@switch:~$ netq show services json
{
    "services":[
        {
            "status":"ok",
            "uptime":1550251734.0,
            "monitored":"yes",
            "service":"ntp",
            "lastChanged":1550251734.4790000916,
            "pid":"8478",
```

```
        "hostname":"leaf01",
        "enabled":"yes",
        "vrf":"mgmt",
        "active":"yes"
    },
    {
        "status":"ok",
        "uptime":1550251704.0,
        "monitored":"no",
        "service":"ssh",
        "lastChanged":1550251704.0929999352,
        "pid":"2106",
        "hostname":"leaf01",
        "enabled":"yes",
        "vrf":"default",
        "active":"yes"
    },
    {
        "status":"ok",
        "uptime":1550251736.0,
        "monitored":"yes",
        "service":"lldpd",
        "lastChanged":1550251736.5160000324,
        "pid":"2651",
        "hostname":"leaf01",
        "enabled":"yes",
        "vrf":"default",
        "active":"yes"
    },
```

```
        {
            "status":"ok",
            "uptime":1550251704.0,
            "monitored":"yes",
            "service":"bgpd",
            "lastChanged":1550251704.1040000916,
            "pid":"2872",
            "hostname":"leaf01",
            "enabled":"yes",
            "vrf":"default",
            "active":"yes"
        },
        {
            "status":"ok",
            "uptime":1550251704.0,
            "monitored":"no",
            "service":"neighmgrd",
            "lastChanged":1550251704.0969998837,
            "pid":"1986",
            "hostname":"leaf01",
            "enabled":"yes",
            "vrf":"default",
            "active":"yes"
        },
...
```


If you want to view the service information for a given device, simply use the `hostname` option when running the command.

### View Information about a Given Service on All Devices

You can view the status of a given service at the current time, at a prior point in time, or view the changes that have occurred for the service during a specified timeframe.

This example shows how to view the status of the NTP service across the network. In this case, VRF is configured so the NTP service runs on both the default and management interface. You can perform the same command with the other services, such as `bgpd`, `lldpd`, and `clagd`.

```
cumulus@switch:~$ netq show services ntp
Matching services records:
Hostname          Service              PID   VRF             Enabled Active Monitored
Status          Uptime                    Last Changed
----------------- -------------------- ----- --------------- ------- ------ --------- ----------------
------------------------- -------------------------
exit01            ntp                  8478  mgmt            yes     yes    yes       ok               1d:6h:
52m:41s           Fri Feb 15 17:28:54 2019
exit02            ntp                  8497  mgmt            yes     yes    yes       ok               1d:6h:
52m:36s           Fri Feb 15 17:28:59 2019
firewall01        ntp                  n/a   default         yes     yes    yes       ok               1d:6h:
53m:4s            Fri Feb 15 17:28:31 2019
hostd-11          ntp                  n/a   default         yes     yes    yes       ok               1d:6h:
52m:46s           Fri Feb 15 17:28:49 2019
hostd-21          ntp                  n/a   default         yes     yes    yes       ok               1d:6h:
52m:37s           Fri Feb 15 17:28:58 2019
hosts-11          ntp                  n/a   default         yes     yes    yes       ok               1d:6h:
52m:28s           Fri Feb 15 17:29:07 2019
hosts-13          ntp                  n/a   default         yes     yes    yes       ok               1d:6h:
52m:19s           Fri Feb 15 17:29:16 2019
```

```
hosts-21        ntp             n/a   default       yes    yes    yes     ok            1d:6h:
52m:14s         Fri Feb 15 17:29:21 2019
hosts-23        ntp             n/a   default       yes    yes    yes     ok            1d:6h:
52m:4s          Fri Feb 15 17:29:31 2019
noc-pr          ntp             2148  default       yes    yes    yes     ok            1d:6h:
53m:43s         Fri Feb 15 17:27:52 2019
noc-se          ntp             2148  default       yes    yes    yes     ok            1d:6h:
53m:38s         Fri Feb 15 17:27:57 2019
spine01         ntp             8414  mgmt          yes    yes    yes     ok            1d:6h:
53m:30s         Fri Feb 15 17:28:05 2019
spine02         ntp             8419  mgmt          yes    yes    yes     ok            1d:6h:
53m:27s         Fri Feb 15 17:28:08 2019
spine03         ntp             8443  mgmt          yes    yes    yes     ok            1d:6h:
53m:22s         Fri Feb 15 17:28:13 2019
leaf01          ntp             8765  mgmt          yes    yes    yes     ok            1d:6h:
52m:52s         Fri Feb 15 17:28:43 2019
leaf02          ntp             8737  mgmt          yes    yes    yes     ok            1d:6h:
52m:46s         Fri Feb 15 17:28:49 2019
leaf11          ntp             9305  mgmt          yes    yes    yes     ok            1d:6h:
49m:22s         Fri Feb 15 17:32:13 2019
leaf12          ntp             9339  mgmt          yes    yes    yes     ok            1d:6h:
49m:9s          Fri Feb 15 17:32:26 2019
leaf21          ntp             9367  mgmt          yes    yes    yes     ok            1d:6h:
49m:5s          Fri Feb 15 17:32:30 2019
leaf22          ntp             9403  mgmt          yes    yes    yes     ok            1d:6h:
52m:57s         Fri Feb 15 17:28:38 2019
```

This example shows the status of the BGP daemon.

```
cumulus@switch:~$ netq show services bgpd
Matching services records:
Hostname          Service              PID   VRF             Enabled Active Monitored
Status          Uptime                   Last Changed
----------------- -------------------- ----- --------------- ------- ------ --------- ----------------
------------------------ -------------------------
exit01           bgpd                2872  default         yes     yes    yes       ok             1d:6h:
54m:37s          Fri Feb 15 17:28:24 2019
exit02           bgpd                2867  default         yes     yes    yes       ok             1d:6h:
54m:33s          Fri Feb 15 17:28:28 2019
firewall01       bgpd                21766 default         yes     yes    yes       ok             1d:6h:
54m:54s          Fri Feb 15 17:28:07 2019
spine01          bgpd                2953  default         yes     yes    yes       ok             1d:6h:
55m:27s          Fri Feb 15 17:27:34 2019
spine02          bgpd                2948  default         yes     yes    yes       ok             1d:6h:
55m:23s          Fri Feb 15 17:27:38 2019
spine03          bgpd                2953  default         yes     yes    yes       ok             1d:6h:
55m:18s          Fri Feb 15 17:27:43 2019
leaf01           bgpd                3221  default         yes     yes    yes       ok             1d:6h:
54m:48s          Fri Feb 15 17:28:13 2019
leaf02           bgpd                3177  default         yes     yes    yes       ok             1d:6h:
54m:42s          Fri Feb 15 17:28:19 2019
leaf11           bgpd                3521  default         yes     yes    yes       ok             1d:6h:
51m:18s          Fri Feb 15 17:31:43 2019
leaf12           bgpd                3527  default         yes     yes    yes       ok             1d:6h:
51m:6s           Fri Feb 15 17:31:55 2019
leaf21           bgpd                3512  default         yes     yes    yes       ok             1d:6h:
51m:1s           Fri Feb 15 17:32:00 2019
```

```
leaf22          bgpd            3536  default       yes    yes    yes      ok          1d:6h:
54m:54s         Fri Feb 15 17:28:07 2019
```

### View Events Related to a Given Service

To view changes over a given time period, use the `netq show events` command. For more detailed information about events, refer to Monitor Events.

In this example, we want to view changes to the bgpd service in the last 48 hours.

```
cumulus@switch:/$ netq show events type bgp between now and 48h
Matching events records:
Hostname          Message Type Severity Message                              Timestamp
----------------- ------------ -------- ----------------------------------- -------------------------
leaf01            bgp          info     BGP session with peer spine-1 swp3. 1d:6h:55m:37s
                                        3 vrf DataVrf1081 state changed fro
                                        m failed to Established
leaf01            bgp          info     BGP session with peer spine-2 swp4. 1d:6h:55m:37s
                                        3 vrf DataVrf1081 state changed fro
                                        m failed to Established
leaf01            bgp          info     BGP session with peer spine-3 swp5. 1d:6h:55m:37s
                                        3 vrf DataVrf1081 state changed fro
                                        m failed to Established
leaf01            bgp          info     BGP session with peer spine-1 swp3. 1d:6h:55m:37s
                                        2 vrf DataVrf1080 state changed fro
                                        m failed to Established
leaf01            bgp          info     BGP session with peer spine-3 swp5. 1d:6h:55m:37s
                                        2 vrf DataVrf1080 state changed fro
                                        m failed to Established
```

| | | | | |
|---|---|---|---|---|
| leaf01 | bgp | info | BGP session with peer spine-2 swp4.2 vrf DataVrf1080 state changed from failed to Established | 1d:6h:55m:37s |
| leaf01 | bgp | info | BGP session with peer spine-3 swp5.4 vrf DataVrf1082 state changed from failed to Established | 1d:6h:55m:37s |

# Monitor Physical Layer Components

With NetQ, a network administrator can monitor OSI Layer 1 physical components on network devices, including interfaces, ports, links, and peers. NetQ provides the ability to:

- Manage physical inventory: view the performance and status of various components of a switch or host server
- Validate configurations: verify the configuration of network peers and ports

It helps answer questions such as:

- Are any individual or bonded links down?
- Are any links flapping?
- Is there a link mismatch anywhere in my network?
- Which interface ports are empty?
- Which transceivers are installed?
- What is the peer for a given port?

NetQ uses LLDP (Link Layer Discovery Protocol) to collect port information. NetQ can also identify peer ports connected to DACs (Direct Attached Cables) and AOCs (Active Optical Cables) without using LLDP, even if the link is not UP.

## Monitor Physical Layer Inventory

Keeping track of the various physical layer components in your switches and servers ensures you have a fully functioning network and provides inventory management and audit capabilities. You can monitor ports, transceivers, and cabling deployed on a per port (interface), per vendor, per part number and so forth. NetQ enables you to view the current status and the status an earlier point in time. From this information, you can, among other things:

- determine which ports are empty versus which ones have cables plugged in and thereby validate expected connectivity
- audit transceiver and cable components used by vendor, giving you insights for estimated replacement costs, repair costs, overall costs, and so forth to improve your maintenance and purchasing processes
- identify changes in your physical layer, and when they occurred

The `netq show interfaces physical` command is used to obtain the information from the devices. Its syntax is:

```
netq [<hostname>] show interfaces physical [<physical-port>] [empty|plugged]
[peer] [vendor <module-vendor>|model <module-model>|module] [around <text-time>] [json]
netq [<hostname>] show events [level info|level error|level warning|level critical|
level debug] type interfaces-physical [between <text-time> and <text-endtime>]
[json]
```

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the `<text-time>` is the most recent time and the `<text-endtime>` is the oldest time. The values are not required to have the same unit of measure.

### View Detailed Cable Information for All Devices

You can view what cables are connected to each interface port for all devices, including the module type, vendor, part number and performance characteristics. You can also view the cable information for a given device by adding a hostname to the `show` command. This example shows cable information and status for all interface ports on all devices.

```
cumulus@switch:~$ netq show interfaces physical
Matching cables records:
Hostname         Interface                 State      Speed      AutoNeg Module
Vendor               Part No          Last Changed
----------------- ------------------------- ---------- ---------- ------- --------- -------------------- ----------------
```

```
------------------------
edge01      eth0          up    1G    on   RJ45   n/a        n/
a       Fri Jun  7 00:42:52 2019
edge01      eth1          down   1G    off  RJ45   n/a        n/
a       Fri Jun  7 00:42:52 2019
edge01      eth2          down   1G    off  RJ45   n/a        n/
a       Fri Jun  7 00:42:52 2019
edge01      vagrant        down   1G    on   RJ45   n/a        n/
a       Fri Jun  7 00:42:52 2019
exit01     eth0          up    1G    off  RJ45   n/a        n/a
Fri Jun  7 00:42:52 2019
exit01     swp1          down   Unknown  off  RJ45   n/a        n/
a       Fri Jun  7 00:43:03 2019
exit01     swp44         up    1G    off  RJ45   n/a        n/
a       Fri Jun  7 00:51:28 2019
exit01     swp45         down   Unknown  off  RJ45   n/a        n/
a       Fri Jun  7 00:43:03 2019
exit01     swp46         down   Unknown  off  RJ45   n/a        n/
a       Fri Jun  7 00:43:03 2019
exit01     swp47         down   Unknown  off  RJ45   n/a        n/
a       Fri Jun  7 00:43:03 2019
exit01     swp48         down   Unknown  off  RJ45   n/a        n/
a       Fri Jun  7 00:43:03 2019
exit01     swp49         down   Unknown  off  RJ45   n/a        n/
a       Fri Jun  7 00:43:03 2019
exit01     swp50         down   Unknown  off  RJ45   n/a        n/
a       Fri Jun  7 00:42:53 2019
exit01     swp51         up    1G    off  RJ45   n/a        n/
a       Fri Jun  7 00:51:28 2019
```

```
exit01      swp52          up     1G      off    RJ45    n/a         n/
a       Fri Jun  7 00:51:28 2019
exit01      vagrant        down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:03 2019
exit02      eth0           up     1G      off    RJ45    n/a         n/a
Fri Jun  7 00:42:51 2019
exit02      swp1           down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:01 2019
exit02      swp44          up     1G      off    RJ45    n/a         n/
a       Fri Jun  7 00:51:28 2019
exit02      swp45          down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:01 2019
exit02      swp46          down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:01 2019
exit02      swp47          down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:01 2019
exit02      swp48          down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:01 2019
exit02      swp49          down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:01 2019
exit02      swp50          down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:01 2019
exit02      swp51          up     1G      off    RJ45    n/a         n/
a       Fri Jun  7 00:51:28 2019
exit02      swp52          up     1G      off    RJ45    n/a         n/
a       Fri Jun  7 00:51:28 2019
exit02      vagrant        down   Unknown  off   RJ45    n/a         n/
a       Fri Jun  7 00:43:01 2019
leaf01      eth0           up     1G      off    RJ45    n/a         n/a
```

```
Fri Jun  7 00:43:02 2019
leaf01         swp1              up       1G       off    RJ45     n/a             n/a
Fri Jun  7 00:52:03 2019
leaf01         swp2              up       1G       off    RJ45     n/a             n/a
Fri Jun  7 00:52:03 2019
...
```

### View Detailed Module Information for a Given Device

You can view detailed information about the transceiver modules on each interface port, including serial number, transceiver type, connector and attached cable length. You can also view the module information for a given device by adding a hostname to the `show` command. This example shows the detailed module information for the interface ports on *leaf02* switch.

```
cumulus@switch:~$ netq leaf02 show interfaces physical module
Matching cables records are:
Hostname         Interface              Module    Vendor             Part No          Serial
No              Transceiver      Connector        Length Last Changed


----------------- ------------------------- --------- -------------------- ---------------- -------------------------
---------------- ---------------- ------ -------------------------
leaf02          swp1                   RJ45      n/a                n/a            n/a                   n/
a             n/a             n/a    Thu Feb  7 22:49:37 2019
leaf02          swp2                   SFP       Mellanox           MC2609130-003
MT1507VS05177            1000Base-CX,Copp Copper pigtail   3m     Thu Feb  7
22:49:37 2019
                                                                        er Passive,Twin
                                                                        Axial Pair (TW)
```

```
leaf02      swp47         QSFP+    CISCO        AFBR-7IER05Z-CS1
AVE1823402U        n/a        n/a        5m    Thu Feb  7 22:49:37 2019
leaf02      swp48         QSFP28   TE Connectivity    2231368-1
15250052         100G Base-CR4 or n/a        3m    Thu Feb  7 22:49:37 2019
                                                      25G Base-CR CA-L
                                                      ,40G Base-
CR4
leaf02      swp49         SFP      OEM          SFP-10GB-LR
ACSLR130408        10G Base-LR    LC         10km,  Thu Feb  7 22:49:37 2019

10000m
leaf02      swp50         SFP      JDSU         PLRXPLSCS4322N
CG03UF45M          10G Base-SR,Mult LC         80m,   Thu Feb  7 22:49:37 2019

imode,              30m,
                                                      50um
(M5),Multim         300m
                                                      ode,
                                                      62.5um (M6),Shor
                                                      twave laser w/o
                                                      OFC (SN),interme
                                                      diate distance (
                                                      I)
leaf02      swp51         SFP      Mellanox       MC2609130-003
MT1507VS05177        1000Base-CX,Copp Copper pigtail  3m    Thu Feb  7
22:49:37 2019
                                                      er Passive,Twin
                                                      Axial Pair (TW)
```

```
leaf02        swp52             SFP      FINISAR CORP.      FCLF8522P2BTL
PTN1VH2              1000Base-T      RJ45          100m   Thu Feb  7 22:49:37 2019
```

### View Ports without Cables Connected for a Given Device

Checking for empty ports enables you to compare expected versus actual deployment. This can be very helpful during deployment or during upgrades. You can also view the cable information for a given device by adding a hostname to the `show` command. This example shows the ports that are empty on leaf01 switch.

```
cumulus@switch:~$ netq leaf01 show interfaces physical empty
Matching cables records are:
Hostname        Interface State Speed      AutoNeg Module    Vendor         Part
No         Last Changed
---------------- --------- ----- ---------- ------- --------- ---------------- ---------------- ------------------------
leaf01         swp49     down  Unknown    on     empty     n/a           n/a           Thu
Feb  7 22:49:37 2019
leaf01         swp52     down  Unknown    on     empty     n/a           n/a           Thu
Feb  7 22:49:37 2019
```

### View Ports with Cables Connected for a Given Device

In a similar manner as checking for empty ports, you can check for ports that have cables connected, enabling you to compare expected versus actual deployment. You can also view the cable information for a given device by adding a hostname to the `show` command. If you add the around keyword, you can view which interface ports had cables connected at a previous time. This example shows the ports of *leaf01* switch that have attached cables.

```
cumulus@switch:~$ netq leaf01 show interfaces physical plugged
Matching cables records:
Hostname Interface State Speed AutoNeg Module
Vendor Part No Last Changed
---------------- ------------------------ ---------- ---------- ------- --------- ------------------- ----------------
------------------------
leaf01 eth0 up 1G on RJ45 n/a n/a
Thu Feb  7 22:49:37 2019
leaf01 swp1 up 10G off SFP Amphenol
610640005 Thu Feb  7 22:49:37 2019
leaf01 swp2 up 10G off SFP Amphenol
610640005 Thu Feb  7 22:49:37 2019
leaf01 swp3 down 10G off SFP Mellanox
MC3309130-001 Thu Feb  7 22:49:37 2019
leaf01 swp33 down 10G off SFP OEM SFP-
H10GB-CU1M Thu Feb  7 22:49:37 2019
leaf01 swp34 down 10G off SFP Amphenol
571540007 Thu Feb  7 22:49:37 2019
leaf01 swp35 down 10G off SFP Amphenol
571540007 Thu Feb  7 22:49:37 2019
leaf01 swp36 down 10G off SFP OEM SFP-
H10GB-CU1M Thu Feb  7 22:49:37 2019
leaf01 swp37 down 10G off SFP OEM SFP-
H10GB-CU1M Thu Feb  7 22:49:37 2019
leaf01 swp38 down 10G off SFP OEM SFP-
H10GB-CU1M Thu Feb  7 22:49:37 2019
leaf01 swp39 down 10G off SFP Amphenol
571540007 Thu Feb  7 22:49:37 2019
leaf01 swp40 down 10G off SFP Amphenol
```

```
571540007      Thu Feb  7 22:49:37 2019
leaf01         swp49              up       40G      off    QSFP+    Amphenol
624410001      Thu Feb  7 22:49:37 2019
leaf01         swp5               down      10G      off    SFP      Amphenol
571540007      Thu Feb  7 22:49:37 2019
leaf01         swp50              down      40G      off    QSFP+    Amphenol
624410001      Thu Feb  7 22:49:37 2019
leaf01         swp51              down      40G      off    QSFP+    Amphenol
603020003      Thu Feb  7 22:49:37 2019
leaf01         swp52              up       40G      off    QSFP+    Amphenol
603020003      Thu Feb  7 22:49:37 2019
leaf01         swp54              down      40G      off    QSFP+    Amphenol
624410002      Thu Feb  7 22:49:37 2019
```

View Components from a Given Vendor

By filtering for a specific cable vendor, you can collect information such as how many ports use components from that vendor and when they were last updated. This information may be useful when you run a cost analysis of your network. This example shows all the ports that are using components by an *OEM* vendor.

```
cumulus@switch:~$ netq leaf01 show interfaces physical vendor OEM
Matching cables records:
Hostname         Interface               State     Speed     AutoNeg Module
Vendor             Part No          Last Changed
----------------- ------------------------- ---------- ---------- ------- --------- ------------------- ----------------
------------------------
leaf01         swp33              down      10G      off    SFP      OEM             SFP-
H10GB-CU1M   Thu Feb  7 22:49:37 2019
```

```
leaf01          swp36                down      10G       off    SFP      OEM               SFP-
H10GB-CU1M   Thu Feb  7 22:49:37 2019
leaf01          swp37                down      10G       off    SFP      OEM               SFP-
H10GB-CU1M   Thu Feb  7 22:49:37 2019
leaf01          swp38                down      10G       off    SFP      OEM               SFP-
H10GB-CU1M   Thu Feb  7 22:49:37 2019
```

### View All Devices Using a Given Component

You can view all of the devices with ports using a particular component. This could be helpful when you need to change out a particular component for possible failure issues, upgrades, or cost reasons. This example first determines which models (part numbers) exist on all of the devices and then those devices with a part number of QSFP-H40G-CU1M installed.

```
cumulus@switch:~$ netq show interfaces physical model
    2231368-1         :  2231368-1
    624400001         :  624400001
    QSFP-H40G-CU1M    :  QSFP-H40G-CU1M
    QSFP-H40G-CU1MUS  :  QSFP-H40G-CU1MUS
    n/a               :  n/a

cumulus@switch:~$ netq show interfaces physical model QSFP-H40G-CU1M
Matching cables records:
Hostname          Interface                State      Speed      AutoNeg Module
Vendor               Part No           Last Changed
----------------- ------------------------- ---------- ---------- ------- --------- ------------------- ----------------
------------------------
leaf01          swp50                up       1G       off    QSFP+    OEM               QSFP-
```

```
H40G-CU1M   Thu Feb  7 18:31:20 2019
leaf02          swp52               up       1G        off     QSFP+     OEM              QSFP-
H40G-CU1M   Thu Feb  7 18:31:20 2019
```

### View Changes to Physical Components

Because components are often changed, NetQ enables you to determine what, if any, changes have been made to the physical components on your devices. This can be helpful during deployments or upgrades.

You can select how far back in time you want to go, or select a time range using the between keyword. Note that time values must include units to be valid. If no changes are found, a "No matching cable records found" message is displayed. This example illustrates each of these scenarios for all devices in the network.

```
cumulus@switch:~$ netq show events type interfaces-physical between now and
30d
Matching cables records:
Hostname        Interface              State     Speed      AutoNeg Module
Vendor             Part No         Last Changed
----------------- ------------------------- ----------- ----------- -------- ---------- -------------------- ----------------
-------------------------
leaf01          swp1                up       1G        off     SFP       AVAGO
AFBR-5715PZ-JU1  Thu Feb  7 18:34:20 2019
leaf01          swp2                up       10G       off     SFP       OEM
SFP-10GB-LR      Thu Feb  7 18:34:20 2019
leaf01          swp47               up       10G       off     SFP       JDSU
PLRXPLSCS4322N   Thu Feb  7 18:34:20 2019
leaf01          swp48               up       40G       off     QSFP+     Mellanox
```

```
MC2210130-002    Thu Feb  7 18:34:20 2019
leaf01           swp49                 down      10G       off     empty     n/a               n/
a            Thu Feb  7 18:34:20 2019
leaf01           swp50                 up        1G        off     SFP       FINISAR CORP.
FCLF8522P2BTL    Thu Feb  7 18:34:20 2019
leaf01           swp51                 up        1G        off     SFP       FINISAR CORP.
FTLF1318P3BTL    Thu Feb  7 18:34:20 2019
leaf01           swp52                 down      1G        off     SFP       CISCO-AGILENT
QFBR-5766LP      Thu Feb  7 18:34:20 2019
leaf02           swp1                  up        1G        on      RJ45      n/a               n/
a            Thu Feb  7 18:34:20 2019
leaf02           swp2                  up        10G       off     SFP       Mellanox
MC2609130-003    Thu Feb  7 18:34:20 2019
leaf02           swp47                 up        10G       off     QSFP+     CISCO
AFBR-7IER05Z-CS1 Thu Feb  7 18:34:20 2019
leaf02           swp48                 up        10G       off     QSFP+     Mellanox
MC2609130-003    Thu Feb  7 18:34:20 2019
leaf02           swp49                 up        10G       off     SFP       FIBERSTORE
SFP-10GLR-31     Thu Feb  7 18:34:20 2019
leaf02           swp50                 up        1G        off     SFP       OEM               SFP-GLC-
T        Thu Feb  7 18:34:20 2019
leaf02           swp51                 up        10G       off     SFP       Mellanox
MC2609130-003    Thu Feb  7 18:34:20 2019
leaf02           swp52                 up        1G        off     SFP       FINISAR CORP.
FCLF8522P2BTL    Thu Feb  7 18:34:20 2019
leaf03           swp1                  up        10G       off     SFP       Mellanox
MC2609130-003    Thu Feb  7 18:34:20 2019
leaf03           swp2                  up        10G       off     SFP       Mellanox
MC3309130-001    Thu Feb  7 18:34:20 2019
```

```
leaf03          swp47                 up        10G       off     SFP       CISCO-AVAGO
AFBR-7IER05Z-CS1 Thu Feb  7 18:34:20 2019
leaf03          swp48                 up        10G       off     SFP       Mellanox
MC3309130-001    Thu Feb  7 18:34:20 2019
leaf03          swp49                 down      1G        off     SFP       FINISAR CORP.
FCLF8520P2BTL    Thu Feb  7 18:34:20 2019
leaf03          swp50                 up        1G        off     SFP       FINISAR CORP.
FCLF8522P2BTL    Thu Feb  7 18:34:20 2019
leaf03          swp51                 up        10G       off     QSFP+     Mellanox
MC2609130-003    Thu Feb  7 18:34:20 2019
...
oob-mgmt-server   swp1                  up        1G        off     RJ45      n/a              n/
a            Thu Feb  7 18:34:20 2019
oob-mgmt-server   swp2                  up        1G        off     RJ45      n/a              n/
a            Thu Feb  7 18:34:20 2019

cumulus@switch:~$ netq show events interfaces-physical between 6d and 16d
Matching cables records:
Hostname          Interface                 State     Speed     AutoNeg Module
Vendor               Part No           Last Changed
----------------- ------------------------- ---------- ---------- ------- --------- ------------------- ----------------
------------------------
leaf01          swp1                  up        1G        off     SFP       AVAGO
AFBR-5715PZ-JU1  Thu Feb  7 18:34:20 2019
leaf01          swp2                  up        10G       off     SFP       OEM
SFP-10GB-LR      Thu Feb  7 18:34:20 2019
leaf01          swp47                 up        10G       off     SFP       JDSU
PLRXPLSCS4322N   Thu Feb  7 18:34:20 2019
leaf01          swp48                 up        40G       off     QSFP+     Mellanox
```

```
MC2210130-002    Thu Feb  7 18:34:20 2019
leaf01           swp49                  down       10G       off     empty     n/a                n/
a            Thu Feb  7 18:34:20 2019
leaf01           swp50                  up         1G        off     SFP       FINISAR CORP.
FCLF8522P2BTL    Thu Feb  7 18:34:20 2019
leaf01           swp51                  up         1G        off     SFP       FINISAR CORP.
FTLF1318P3BTL    Thu Feb  7 18:34:20 2019
leaf01           swp52                  down       1G        off     SFP       CISCO-AGILENT
QFBR-5766LP      Thu Feb  7 18:34:20 2019
...

cumulus@switch:~$ netq show events type interfaces-physical between 0s and 5h
No matching cables records found
```

## Validate Physical Layer Configuration

Beyond knowing what physical components are deployed, it is valuable to know that they are configured and operating correctly. NetQ enables you to confirm that peer connections are present, discover any misconfigured ports, peers, or unsupported modules, and monitor for link flaps.

NetQ checks peer connections using LLDP. For DACs and AOCs, NetQ determines the peers using their serial numbers in the port EEPROMs, even if the link is not UP.

### Confirm Peer Connections

You can validate peer connections for all devices in your network or for a specific device or port. This example shows the peer hosts and their status for leaf03 switch.

```
cumulus@switch:~$ netq leaf03 show interfaces physical peer
Matching cables records:
Hostname         Interface                 Peer Hostname     Peer Interface            State
Message
---------------- ------------------------- ----------------- ------------------------- ----------
-----------------------------------
leaf03           swp1                      oob-mgmt-switch   swp7
up
leaf03           swp2                                                                  down       Peer port
unknown
leaf03           swp47                     leaf04            swp47                     up
leaf03           swp48                     leaf04            swp48                     up
leaf03           swp49                     leaf04            swp49                     up
leaf03           swp50                     leaf04            swp50                     up
leaf03           swp51                     exit01            swp51                     up
leaf03           swp52                                                                 down       Port cage
empty
```

This example shows the peer data for a specific interface port.

```
cumulus@switch:~$ netq leaf01 show interfaces physical swp47
Matching cables records:
Hostname         Interface                 Peer Hostname     Peer Interface            State
Message
---------------- ------------------------- ----------------- ------------------------- ----------
-----------------------------------
leaf01           swp47                     leaf02            swp47                     up
```

### Discover Misconfigurations

You can verify that the following configurations are the same on both sides of a peer interface:

- Admin state
- Operational state
- Link speed
- Auto-negotiation setting

The `netq check interfaces` command is used to determine if any of the interfaces have any continuity errors. This command only checks the physical interfaces; it does not check bridges, bonds or other software constructs. You can check all interfaces at once. It enables you to compare the current status of the interfaces, as well as their status at an earlier point in time. The command syntax is:

```
netq check interfaces [around <text-time>] [json]
```

> TIP
>
> If NetQ cannot determine a peer for a given device, the port is marked as *unverified*.

If you find a misconfiguration, use the `netq show interfaces physical` command for clues about the cause.

**Example: Find Mismatched Operational States**

In this example, we check all of the interfaces for misconfigurations and we find that one interface port has an error. We look for clues about the cause and see that the Operational states do not match on the connection between leaf 03 and leaf04: leaf03 is up, but leaf04 is down. If the misconfiguration was due to a mismatch in the administrative state, the message would have been *Admin state mismatch (up, down)* or *Admin state mismatch (down, up)*.

```
cumulus@switch:~$ netq check interfaces
Checked Nodes: 18, Failed Nodes: 8
Checked Ports: 741, Failed Ports: 1, Unverified Ports: 414

cumulus@switch:~$ netq show interfaces physical peer
Matching cables records:
Hostname        Interface            Peer Hostname    Peer Interface         Message
---------------- ------------------------ ---------------- ------------------------
---------------------------------
...
leaf03          swp1                 oob-mgmt-switch
swp7
leaf03          swp2                                                   Peer port
unknown
leaf03          swp47                leaf04           swp47
leaf03          swp48                leaf04           swp48               State mismatch (up,
down)
leaf03          swp49                leaf04           swp49
leaf03          swp50                leaf04           swp50
leaf03          swp52                                                  Port cage
empty
...
```

**Example: Find Mismatched Peers**

This example uses the *and* keyword to check the connections between two peers. An error is seen, so we check the physical peer information and discover that the incorrect peer has been specified. After fixing it, we run the check again, and see that there are no longer any interface errors.

```
cumulus@switch:~$ netq check interfaces
Checked Nodes: 1, Failed Nodes: 1
Checked Ports: 1, Failed Ports: 1, Unverified Ports: 0
cumulus@switch:~$ netq show interfaces physical peer

Matching cables records:
Hostname        Interface              Peer Hostname    Peer Interface          Message
----------------- ------------------------ ----------------- ------------------------
----------------------------------
leaf01          swp50                  leaf04           swp49                   Incorrect peer
specified. Real peer
                                                                               is leaf04 swp50

cumulus@switch:~$ netq check interfaces
Checked Nodes: 1, Failed Nodes: 0
Checked Ports: 1, Failed Ports: 0, Unverified Ports: 0
```

**Example: Find Mismatched Link Speeds**

This example checks for for configuration mismatches and finds a link speed mismatch on server03. The link speed on swp49 is *40G* and the peer port swp50 is *unspecified*.

```
cumulus@switch:~$ netq check interfaces
Checked Nodes: 10, Failed Nodes: 1
Checked Ports: 125, Failed Ports: 2, Unverified Ports: 35
```

```
Hostname          Interface                 Peer Hostname     Peer Interface            Message
----------------- ------------------------- ----------------- -------------------------
-----------------------------------
server03          swp49                     server03          swp50                     Speed mismatch
(40G, Unknown)
server03          swp50                     server03          swp49                     Speed mismatch
(Unknown, 40G)
```

**Example: Find Mismatched Auto-negotiation Settings**

This example checks for configuration mismatches and finds auto-negotation setting mismatches between the servers and leafs. Auto-negotiation is *off* on the leafs, but *on* on the servers.

```
cumulus@switch:~$ netq check interfaces
Checked Nodes: 15, Failed Nodes: 8
Checked Ports: 118, Failed Ports: 8, Unverified Ports: 94
Hostname          Interface                 Peer Hostname     Peer Interface            Message
----------------- ------------------------- ----------------- -------------------------
-----------------------------------
leaf01            swp1                      server01          eth1                      Autoneg mismatch
(off, on)
leaf02            swp2                      server02          eth2                      Autoneg mismatch
(off, on)
leaf03            swp1                      server03          eth1                      Autoneg mismatch
(off, on)
leaf04            swp2                      server04          eth2                      Autoneg mismatch
(off, on)
```

```
server01     eth1          leaf01     swp1          Autoneg mismatch
(on, off)
server02     eth2          leaf02     swp2          Autoneg mismatch
(on, off)
server03     eth1          leaf03     swp1          Autoneg mismatch
(on, off)
server04     eth2          leaf04     swp2          Autoneg mismatch
(on, off)
```

### Identify Flapping Links

You can also determine whether a link is flapping using the `netq check interfaces` command. If a link is flapping, NetQ indicates this in a message:

```
cumulus@switch:~$ netq check interfaces
Checked Nodes: 18, Failed Nodes: 8
Checked Ports: 741, Failed Ports: 1, Unverified Ports: 414

Matching cables records:
Hostname        Interface             Peer Hostname    Peer Interface          Message
----------------- ------------------------- ----------------- -------------------------
-----------------------------------
leaf02          -                     -             -                   Link flapped 11 times in last 5
                                                                    mins
```

# Monitor Data Link Layer Devices and Protocols

With NetQ, a network administrator can monitor OSI Layer 2 devices and protocols, including switches, bridges, link control, and physical media access. Keeping track of the various data link layer devices in your network ensures consistent and error-free communications between devices. NetQ provides the ability to:

- Monitor and validate device and protocol configurations
- View available communication paths between devices

It helps answer questions such as:

- Is a VLAN misconfigured?
- Is there an MTU mismatch in my network?
- Is MLAG configured correctly?
- Is there an STP loop?
- Can device A reach device B using MAC addresses?

## Monitor LLDP Operation

LLDP is used by network devices for advertising their identity, capabilities, and neighbors on a LAN. You can view this information for one or more devices. You can also view the information at an earlier point in time or view changes that have occurred to the information during a specified timeframe. NetQ enables you to view LLDP information for your devices using the `netq show lldp` command. The syntax for this command is:

```
netq [<hostname>] show lldp [<remote-physical-interface>] [around <text-time>]
[json]
netq [<hostname>] show events [level info|level error|level warning|level critical|
level debug] type lldp [between <text-time> and <text-endtime>] [json]
```

### View LLDP Information for All Devices

This example shows the interface and peer information that is advertised for each device.

```
cumulus@switch:~$ netq show lldp

Matching lldp records:
Hostname          Interface                 Peer Hostname     Peer Interface            Last
Changed
----------------- ------------------------- ----------------- ------------------------- -------------------------
exit01            swp1                      edge01            swp5                      Thu Feb  7 18:31:53
2019
exit01            swp2                      edge02            swp5                      Thu Feb  7 18:31:53
2019
exit01            swp3                      spine01           swp9                      Thu Feb  7 18:31:53
2019
exit01            swp4                      spine02           swp9                      Thu Feb  7 18:31:53
2019
exit01            swp5                      spine03           swp9                      Thu Feb  7 18:31:53
2019
exit01            swp6                      firewall01        mac:00:02:00:00:00:11     Thu Feb  7
18:31:53 2019
```

```
exit01           swp7                 firewall02       swp3                  Thu Feb  7 18:31:53 2019
exit02           swp1                 edge01           swp6                  Thu Feb  7 18:31:49 2019
exit02           swp2                 edge02           swp6                  Thu Feb  7 18:31:49 2019
exit02           swp3                 spine01          swp10                 Thu Feb  7 18:31:49 2019
exit02           swp4                 spine02          swp10                 Thu Feb  7 18:31:49 2019
exit02           swp5                 spine03          swp10                 Thu Feb  7 18:31:49 2019
exit02           swp6                 firewall01       mac:00:02:00:00:00:12     Thu Feb  7 18:31:49 2019
exit02           swp7                 firewall02       swp4                  Thu Feb  7 18:31:49 2019
firewall01       swp1                 edge01           swp14                 Thu Feb  7 18:31:26 2019
firewall01       swp2                 edge02           swp14                 Thu Feb  7 18:31:26 2019
firewall01       swp3                 exit01           swp6                  Thu Feb  7 18:31:26 2019
firewall01       swp4                 exit02           swp6                  Thu Feb  7 18:31:26 2019
firewall02       swp1                 edge01           swp15                 Thu Feb  7 18:31:31 2019
firewall02       swp2                 edge02           swp15                 Thu Feb  7 18:31:31 2019
firewall02       swp3                 exit01           swp7                  Thu Feb  7 18:31:31
```

```
2019
firewall02    swp4              exit02       swp7              Thu Feb  7 18:31:31
2019
server11      swp1              leaf01       swp7              Thu Feb  7 18:31:43
2019
server11      swp2              leaf02       swp7              Thu Feb  7 18:31:43
2019
server11      swp3              edge01       swp16             Thu Feb  7
18:31:43 2019
server11      swp4              edge02       swp16             Thu Feb  7
18:31:43 2019
server12      swp1              leaf01       swp8              Thu Feb  7 18:31:47
2019
server12      swp2              leaf02       swp8              Thu Feb  7 18:31:47
2019
```

## Monitor Interface Health

Interface (link) health can be monitored using the `netq show interfaces` command. You can view status of the links, whether they are operating over a VRF interface, the MTU of the link, and so forth. Using the `hostname` option enables you to view only the interfaces for a given device. View changes to interfaces using the `netq show events` command.

The syntax for these commands is:

```
netq [<hostname>] show interfaces [type bond|type bridge|type eth|type
loopback|type macvlan|type swp|type vlan|type vrf|type vxlan] [state <remote-
interface-state>] [around <text-time>] [json]
```

```
netq <hostname> show interfaces [type bond|type bridge|type eth|type
loopback|type macvlan|type swp|type vlan|type vrf|type vxlan] [state <remote-
interface-state>] [around <text-time>] [count] [json]
netq [<hostname>] show events [level info | level error | level warning | level
critical | level debug] type interfaces [between <text-time> and <text-endtime>]
[json]
```

### View Status for All Interfaces

Viewing the status of all interfaces at once can be helpful when you are trying to compare configuration or status of a set of links, or generally when changes have been made.

This example shows all interfaces network-wide.

```
cumulus@switch:~$ netq show interfaces
Matching link records:
Hostname          Interface                 Type             State      VRF             Details
          Last Changed
----------------- ------------------------- ---------------- ---------- ---------------
-------------------------------- -------------------------
exit01            bridge                    bridge           up         default         , Root bridge:
exit01,           Mon Apr 29 20:57:59 2019
                                                                                        Root port: , Members:  vxlan4001,
                                                                                        bridge,
exit01            eth0                      eth              up         mgmt            MTU: 1500
      Mon Apr 29 20:57:59 2019
exit01            lo                        loopback         up         default         MTU: 65536
          Mon Apr 29 20:57:58 2019
```

```
exit01          mgmt                  vrf          up                    table: 1001, MTU:
65536,          Mon Apr 29 20:57:58 2019
                                                                         Members:  mgmt,  eth0,
exit01          swp1                  swp          down      default       VLANs: , PVID: 0
MTU: 1500        Mon Apr 29 20:57:59 2019
exit01          swp44                 swp          up       vrf1          VLANs: ,
  Mon Apr 29 20:57:58 2019
                                                                         PVID: 0 MTU: 1500 LLDP:
internet:sw
                                                                         p1
exit01          swp45                 swp          down      default       VLANs: , PVID: 0
MTU: 1500        Mon Apr 29 20:57:59 2019
exit01          swp46                 swp          down      default       VLANs: , PVID: 0
MTU: 1500        Mon Apr 29 20:57:59 2019
exit01          swp47                 swp          down      default       VLANs: , PVID: 0
MTU: 1500        Mon Apr 29 20:57:59 2019

...

leaf01          bond01                bond         up       default       Slave:swp1 LLDP:
server01:eth1      Mon Apr 29 20:57:59 2019
leaf01          bond02                bond         up       default       Slave:swp2 LLDP:
server02:eth1      Mon Apr 29 20:57:59 2019
leaf01          bridge                bridge       up       default       , Root bridge:
leaf01,          Mon Apr 29 20:57:59 2019
                                                                         Root port: , Members:  vxlan4001,
                                                                         bond02,  vni24,  vni13,  bond01,
                                                                         bridge,  peerlink,
leaf01          eth0                  eth          up       mgmt          MTU:
```

```
1500                   Mon Apr 29 20:58:00 2019
leaf01        lo                  loopback     up      default      MTU:
65536                  Mon Apr 29 20:57:59 2019
leaf01        mgmt                vrf          up                   table: 1001, MTU:
65536,        Mon Apr 29 20:57:59 2019
                                                                    Members:  mgmt,  eth0,
leaf01        peerlink            bond         up      default      Slave:swp50 LLDP:
leaf02:swp49 LLDP Mon Apr 29 20:58:00 2019
                                                                    : leaf02:swp50
...
```

### View Interface Status for a Given Device

If you are interested in only a the interfaces on a specific device, you can view only those.

This example shows all interfaces on the *spine01* device.

```
cumulus@switch:~$ netq spine01 show interfaces
Matching link records:
Hostname        Interface            Type         State     VRF           Details
        Last Changed
----------------- ------------------------ ---------------- ---------- ---------------
--------------------------------- ------------------------
spine01       eth0                eth          up      mgmt         MTU: 1500
      Mon Apr 29 21:12:47 2019
spine01       lo                  loopback     up      default      MTU: 65536
         Mon Apr 29 21:12:47 2019
spine01       mgmt                vrf          up                   table: 1001, MTU:
```

```
65536,          Mon Apr 29 21:12:46 2019
                                                       Members:  mgmt,  eth0,
spine01         swp1                  swp          up      default        VLANs: ,
     Mon Apr 29 21:12:47 2019
                                                       PVID: 0 MTU: 9216 LLDP:
leaf01:swp5
                                                       1
spine01         swp2                  swp          up      default        VLANs: ,
     Mon Apr 29 21:12:47 2019
                                                       PVID: 0 MTU: 9216 LLDP:
leaf02:swp5
                                                       1
spine01         swp29                  swp          up      default        VLANs: ,
      Mon Apr 29 21:12:47 2019
                                                       PVID: 0 MTU: 9216 LLDP:
exit02:swp5
                                                       1
spine01         swp3                  swp          up      default        VLANs: ,
     Mon Apr 29 21:12:46 2019
                                                       PVID: 0 MTU: 9216 LLDP:
leaf03:swp5
                                                       1
spine01         swp30                  swp          up      default        VLANs: ,
      Mon Apr 29 21:12:47 2019
                                                       PVID: 0 MTU: 9216 LLDP:
exit01:swp5
                                                       1
spine01         swp31                  swp          up      default        VLANs: ,
      Mon Apr 29 21:12:46 2019
```

```
                                              PVID: 0 MTU: 9216 LLDP:
spine02:swp
                                              31
spine01     swp32        swp      up     default     VLANs: ,
    Mon Apr 29 21:12:46 2019
                                              PVID: 0 MTU: 9216 LLDP:
spine02:swp
                                              32
spine01     swp4         swp      up     default     VLANs: ,
   Mon Apr 29 21:12:47 2019
                                              PVID: 0 MTU: 9216 LLDP:
leaf04:swp5
                                              1
```

### View All Interfaces of a Given Type

It can be can be useful to see the status of a particular type of interface.

This example shows all bond interfaces that are down, and then those that are up.

```
cumulus@switch:~$ netq show interfaces type bond state down
No matching link records found

cumulus@switch:~$ netq show interfaces type bond state up
Matching link records:
Hostname      Interface         Type       State    VRF        Details
     Last Changed
----------------- ------------------------- ---------------- ---------- ---------------
----------------------------------- -------------------------
```

```
leaf01      bond01          bond     up     default     Slave:swp1 LLDP:
server01:eth1    Mon Apr 29 21:19:07 2019
leaf01      bond02          bond     up     default     Slave:swp2 LLDP:
server02:eth1    Mon Apr 29 21:19:07 2019
leaf01      peerlink        bond     up     default     Slave:swp50 LLDP:
leaf02:swp49 LLDP Mon Apr 29 21:19:07 2019
                                                  : leaf02:swp50
leaf02      bond01          bond     up     default     Slave:swp1 LLDP:
server01:eth2    Mon Apr 29 21:19:07 2019
leaf02      bond02          bond     up     default     Slave:swp2 LLDP:
server02:eth2    Mon Apr 29 21:19:07 2019
leaf02      peerlink        bond     up     default     Slave:swp50 LLDP:
leaf01:swp49 LLDP Mon Apr 29 21:19:07 2019
                                                  : leaf01:swp50
leaf03      bond03          bond     up     default     Slave:swp1 LLDP:
server03:eth1    Mon Apr 29 21:19:07 2019
leaf03      bond04          bond     up     default     Slave:swp2 LLDP:
server04:eth1    Mon Apr 29 21:19:07 2019
leaf03      peerlink        bond     up     default     Slave:swp50 LLDP:
leaf04:swp49 LLDP Mon Apr 29 21:19:07 2019
                                                  : leaf04:swp50
leaf04      bond03          bond     up     default     Slave:swp1 LLDP:
server03:eth2    Mon Apr 29 21:19:07 2019
leaf04      bond04          bond     up     default     Slave:swp2 LLDP:
server04:eth2    Mon Apr 29 21:19:07 2019
leaf04      peerlink        bond     up     default     Slave:swp50 LLDP:
leaf03:swp49 LLDP Mon Apr 29 21:19:07 2019
                                                  : leaf03:swp50
server01     bond0          bond     up     default     Slave:bond0
```

```
LLDP: leaf02:swp1      Mon Apr 29 21:19:07 2019
server02      bond0           bond       up      default      Slave:bond0
LLDP: leaf02:swp2      Mon Apr 29 21:19:07 2019
server03      bond0           bond       up      default      Slave:bond0
LLDP: leaf04:swp1      Mon Apr 29 21:19:07 2019
server04      bond0           bond       up      default      Slave:bond0
LLDP: leaf04:swp2      Mon Apr 29 21:19:07 2019
```

### View the Total Number of Interfaces

For a quick view of the amount of interfaces currently operating on a device, use the `hostname` and `count` options together.

This example shows the count of interfaces on the *leaf03* switch.

```
cumulus@switch:~$ netq leaf03 show interfaces count
Count of matching link records: 28
```

### View the Total Number of a Given Interface Type

It can be useful to see how many interfaces of a particular type you have on a device.

This example shows the count of swp interfaces are on the *leaf03* switch.

```
cumulus@switch:~$ netq leaf03 show interfaces type swp count
Count of matching link records: 11
```

### View Changes to Interfaces

If you suspect that an interface is not working as expected, seeing a drop in performance or a large number of dropped messages for example, you can view changes that have been made to interfaces network-wide.

This example shows info level events for all interfaces in your network:

```
cumulus@switch:~$ netq show events level info type interfaces between now and
30d
Matching events records:
Hostname         Message Type         Severity       Message
Timestamp
----------------- ------------------------ ---------------- ----------------------------------- -------------------------
server03         link                 info           HostName server03 changed state fro 3d:
12h:8m:28s
                                                     m down to up Interface:eth2
server03         link                 info           HostName server03 changed state fro 3d:
12h:8m:28s
                                                     m down to up Interface:eth1
server01         link                 info           HostName server01 changed state fro 3d:
12h:8m:30s
                                                     m down to up Interface:eth2
server01         link                 info           HostName server01 changed state fro 3d:
12h:8m:30s
                                                     m down to up Interface:eth1
server02         link                 info           HostName server02 changed state fro 3d:
12h:8m:34s
                                                     m down to up Interface:eth2
...
```

## Check for MTU Inconsistencies

The maximum transmission unit (MTU) determines the largest size packet or frame that can be transmitted across a given communication link. When the MTU is not configured to the same value on both ends of the link, communication problems can occur. With

NetQ, you can verify that the MTU is correctly specified for each link using the netq check mtu command.

This example shows that four switches have inconsistently specified link MTUs. Now the network administrator or operator can reconfigure the switches and eliminate the communication issues associated with this misconfiguration.

```
cumulus@switch:~$ netq check mtu
Checked Nodes: 15, Checked Links: 215, Failed Nodes: 4, Failed Links: 7
MTU mismatch found on following links
Hostname        Interface                 MTU    Peer            Peer Interface            Peer
MTU Error
---------------- ------------------------ ------ ---------------- ------------------------ -------- ---------------
spine01         swp30                     9216   exit01          swp51                     1500     MTU
Mismatch
exit01          swp51                     1500   spine01         swp30                     9216     MTU
Mismatch
spine01         swp29                     9216   exit02          swp51                     1500     MTU
Mismatch
exit02          -                         -      -               -                         -        Rotten Agent
exit01          swp52                     1500   spine02         swp30                     9216     MTU
Mismatch
spine02         swp30                     9216   exit01          swp52                     1500     MTU
Mismatch
spine02         swp29                     9216   exit02          swp52                     1500     MTU
Mismatch
```

# Monitor VLAN Configurations

A VLAN (Virtual Local Area Network) enables devices on one or more LANs to communicate as if they were on the same network, without being physically connected. The VLAN enables network administrators to partition a network for functional or security requirements without changing physical infrastructure. With NetQ, you can view the operation of VLANs for one or all devices. You can also view the information at an earlier point in time or view changes that have occurred to the information during a specified timeframe. NetQ enables you to view basic VLAN information for your devices using the `netq show vlan` command. Additional show commands enable you to view VLAN information associated with interfaces and MAC addresses. The syntax for these commands is:

```
netq [<hostname>] show interfaces [type vlan] [state <remote-interface-state>] [around <text-time>] [json]
netq <hostname> show interfaces [type vlan] [state <remote-interface-state>] [around <text-time>] [count] [json]
netq [<hostname>] show events [level info | level error | level warning | level critical | level debug] type vlan [between <text-time> and <text-endtime>] [json]
netq show macs [<mac>] [vlan <1-4096>] [origin] [around <text-time>] [json]
netq <hostname> show macs [<mac>] [vlan <1-4096>] [origin | count] [around <text-time>] [json]
netq <hostname> show macs egress-port <egress-port> [<mac>] [vlan <1-4096>] [origin] [around <text-time>] [json]
netq [<hostname>] show vlan [<1-4096>] [around <text-time>] [json]
```

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the <text-time> is the most recent time and the <text-endtime> is the oldest time. The values do not have to have the same unit of measure.

### View VLAN Information for All Devices

This example shows the VLANs configured across your network.

```
cumulus@switch:~$ netq show vlan
Matching vlan records:
Hostname          VLANs                     SVIs                      Last Changed
----------------- ------------------------- ------------------------- -------------------------
exit01            4001                      4001                      Thu Feb  7 18:31:38 2019
exit02            4001                      4001                      Thu Feb  7 18:31:38 2019
leaf01            1,13,24,4001              13 24 4001                Thu Feb  7 18:31:38 2019
leaf02            1,13,24,4001              13 24 4001                Thu Feb  7 18:31:38 2019
```

```
leaf03        1,13,24,4001        13 24 4001        Thu Feb  7 18:31:38 2019
leaf04        1,13,24,4001        13 24 4001        Thu Feb  7 18:31:38 2019
```

### View VLAN Interface Information

You can view the current or past state of the interfaces associated with VLANs using the `netq show interfaces` command. This provides the status of the interface, its specified MTU, whether it is running over a VRF, and the last time it was changed.

```
cumulus@switch:~$ netq show interfaces type vlan
Matching link records:
Hostname          Interface                 Type             State      VRF             Details
        Last Changed
----------------- ------------------------- ---------------- ---------- ---------------
---------------------------------- -------------------------
exit01            vlan4001                  vlan             up         vrf1            MTU:1500
        Fri Feb  8 00:24:28 2019
exit02            vlan4001                  vlan             up         vrf1            MTU:1500
        Fri Feb  8 00:24:28 2019
leaf01            peerlink.4094             vlan             up         default         MTU:9000
            Fri Feb  8 00:24:28 2019
leaf01            vlan13                    vlan             up         vrf1            MTU:1500
    Fri Feb  8 00:24:28 2019
leaf01            vlan24                    vlan             up         vrf1            MTU:1500
    Fri Feb  8 00:24:28 2019
leaf01            vlan4001                  vlan             up         vrf1            MTU:1500
        Fri Feb  8 00:24:28 2019
leaf02            peerlink.4094             vlan             up         default         MTU:9000
            Fri Feb  8 00:24:28 2019
```

```
leaf02       vlan13           vlan      up     vrf1       MTU:1500
   Fri Feb  8 00:24:28 2019
leaf02       vlan24           vlan      up     vrf1       MTU:1500
   Fri Feb  8 00:24:28 2019
leaf02       vlan4001           vlan      up     vrf1       MTU:1500
      Fri Feb  8 00:24:28 2019
leaf03       peerlink.4094        vlan      up     default      MTU:9000
           Fri Feb  8 00:24:28 2019
leaf03       vlan13           vlan      up     vrf1       MTU:1500
   Fri Feb  8 00:24:28 2019
leaf03       vlan24           vlan      up     vrf1       MTU:1500
   Fri Feb  8 00:24:28 2019
leaf03       vlan4001           vlan      up     vrf1       MTU:1500
      Fri Feb  8 00:24:28 2019
leaf04       peerlink.4094        vlan      up     default      MTU:9000
           Fri Feb  8 00:24:28 2019
leaf04       vlan13           vlan      up     vrf1       MTU:1500
   Fri Feb  8 00:24:28 2019
leaf04       vlan24           vlan      up     vrf1       MTU:1500
   Fri Feb  8 00:24:28 2019
leaf04       vlan4001           vlan      up     vrf1       MTU:1500
      Fri Feb  8 00:24:28 2019
```

### View MAC Addresses Associated with a VLAN

You can determine the MAC addresses associated with a given VLAN using the `netq show macs vlan` command. The command also provides the hostnames of the devices, the egress port for the interface, whether the MAC address originated from the given device, whether it learns the MAC address from the peer (remote=yes), and the last time the configuration was changed.

This example shows the MAC addresses associated with *VLAN13*.

```
cumulus@switch:~$ netq show macs vlan 13
Matching mac records:
Origin MAC Address        VLAN   Hostname          Egress Port          Remote Last
Changed
------ ----------------- ------ ---------------- ------------------ ------ ------------------------
no     00:03:00:11:11:01  13     leaf01            bond01:server01      no     Fri Feb  8
00:24:28 2019
no     00:03:00:11:11:01  13     leaf02            bond01:server01      no     Fri Feb  8
00:24:28 2019
no     00:03:00:11:11:01  13     leaf03            vni13:leaf01         yes    Fri Feb  8
00:24:28 2019
no     00:03:00:11:11:01  13     leaf04            vni13:leaf01         yes    Fri Feb  8
00:24:28 2019
no     00:03:00:33:33:01  13     leaf01            vni13:10.0.0.134     yes    Fri Feb  8
00:24:28 2019
no     00:03:00:33:33:01  13     leaf02            vni13:10.0.0.134     yes    Fri Feb  8
00:24:28 2019
no     00:03:00:33:33:01  13     leaf03            bond03:server03      no     Fri Feb  8
00:24:28 2019
no     00:03:00:33:33:01  13     leaf04            bond03:server03      no     Fri Feb  8
00:24:28 2019
no     02:03:00:11:11:01  13     leaf01            bond01:server01      no     Fri Feb  8
00:24:28 2019
no     02:03:00:11:11:01  13     leaf02            bond01:server01      no     Fri Feb  8
```

```
00:24:28 2019
no     02:03:00:11:11:01  13     leaf03          vni13:leaf01        yes    Fri Feb  8
00:24:28 2019
no     02:03:00:11:11:01  13     leaf04          vni13:leaf01        yes    Fri Feb  8
00:24:28 2019
no     02:03:00:11:11:02  13     leaf01          bond01:server01     no     Fri Feb  8
00:24:28 2019
no     02:03:00:11:11:02  13     leaf02          bond01:server01     no     Fri Feb  8
00:24:28 2019
no     02:03:00:11:11:02  13     leaf03          vni13:leaf01        yes    Fri Feb  8
00:24:28 2019
no     02:03:00:11:11:02  13     leaf04          vni13:leaf01        yes    Fri Feb  8
00:24:28 2019
no     02:03:00:33:33:01  13     leaf01          vni13:10.0.0.134    yes    Fri Feb  8
00:24:28 2019
no     02:03:00:33:33:01  13     leaf02          vni13:10.0.0.134    yes    Fri Feb  8
00:24:28 2019
no     02:03:00:33:33:01  13     leaf03          bond03:server03     no     Fri Feb  8
00:24:28 2019
no     02:03:00:33:33:01  13     leaf04          bond03:server03     no     Fri Feb  8
00:24:28 2019
no     02:03:00:33:33:02  13     leaf01          vni13:10.0.0.134    yes    Fri Feb  8
00:24:28 2019
no     02:03:00:33:33:02  13     leaf02          vni13:10.0.0.134    yes    Fri Feb  8
00:24:28 2019
no     02:03:00:33:33:02  13     leaf03          bond03:server03     no     Fri Feb  8
00:24:28 2019
no     02:03:00:33:33:02  13     leaf04          bond03:server03     no     Fri Feb  8
00:24:28 2019
```

```
yes    44:38:39:00:00:03  13     leaf01          bridge          no     Fri Feb  8 00:24:28
2019
yes    44:38:39:00:00:15  13     leaf02          bridge          no     Fri Feb  8 00:24:28
2019
yes    44:38:39:00:00:23  13     leaf03          bridge          no     Fri Feb  8 00:24:28
2019
yes    44:38:39:00:00:5c  13     leaf04          bridge          no     Fri Feb  8 00:24:28
2019
yes    44:39:39:ff:00:13  13     leaf01          bridge          no     Fri Feb  8 00:24:28
2019
yes    44:39:39:ff:00:13  13     leaf02          bridge          no     Fri Feb  8 00:24:28
2019
yes    44:39:39:ff:00:13  13     leaf03          bridge          no     Fri Feb  8 00:24:28
2019
yes    44:39:39:ff:00:13  13     leaf04          bridge          no     Fri Feb  8 00:24:28
2019
```

### View MAC Addresses Associated with an Egress Port

You can filter that information down to just the MAC addresses that are associated with a given VLAN that use a particular egress port. This example shows MAC addresses associated with the *leaf03* switch and *VLAN 13* that use the *bridge* port.

```
cumulus@switch:~$ netq leaf03 show macs egress-port bridge vlan 13
Matching mac records:
Origin MAC Address        VLAN   Hostname          Egress Port          Remote Last
Changed
------ ------------------ ------ ----------------- ------------------- ------ ------------------------
yes    44:38:39:00:00:23  13     leaf03          bridge          no     Fri Feb  8 00:24:28
```

```
2019
yes    44:39:39:ff:00:13  13     leaf03         bridge            no     Fri Feb  8 00:24:28
2019
```

### View the MAC Addresses Associated with VRR Configurations

You can view all of the MAC addresses associated with your VRR (virtual router reflector) interface configuration using the `netq show interfaces type macvlan` command. This is useful for determining if the specified MAC address inside a VLAN is the same or different across your VRR configuration.

```
cumulus@switch:~$ netq show interfaces type macvlan
Matching link records:
Hostname         Interface              Type            State     VRF             Details
        Last Changed
----------------- ------------------------- ---------------- ---------- ---------------
----------------------------------- -------------------------
leaf01          vlan13-v0              macvlan         up        vrf1            MAC: 44:39:39:ff:
00:13,           Fri Feb  8 00:28:09 2019
                                                                Mode: Private
leaf01          vlan24-v0              macvlan         up        vrf1            MAC: 44:39:39:ff:
00:24,           Fri Feb  8 00:28:09 2019
                                                                Mode: Private
leaf02          vlan13-v0              macvlan         up        vrf1            MAC: 44:39:39:ff:
00:13,           Fri Feb  8 00:28:09 2019
                                                                Mode: Private
leaf02          vlan24-v0              macvlan         up        vrf1            MAC: 44:39:39:ff:
00:24,           Fri Feb  8 00:28:09 2019
                                                                Mode: Private
```

```
leaf03       vlan13-v0         macvlan     up      vrf1        MAC: 44:39:39:ff:
00:13,        Fri Feb  8 00:28:09 2019
                                                   Mode: Private
leaf03       vlan24-v0         macvlan     up      vrf1        MAC: 44:39:39:ff:
00:24,        Fri Feb  8 00:28:09 2019
                                                   Mode: Private
leaf04       vlan13-v0         macvlan     up      vrf1        MAC: 44:39:39:ff:
00:13,        Fri Feb  8 00:28:09 2019
                                                   Mode: Private
leaf04       vlan24-v0         macvlan     up      vrf1        MAC: 44:39:39:ff:
00:24,        Fri Feb  8 00:28:09 2019
                                                   Mode: Private
```

## Monitor MLAG Configurations

Multi-Chassis Link Aggregation (MLAG) is used to enable a server or switch with a two-port bond (such as a link aggregation group/LAG, EtherChannel, port group or trunk) to connect those ports to different switches and operate as if they are connected to a single, logical switch. This provides greater redundancy and greater system throughput. Dual-connected devices can create LACP bonds that contain links to each physical switch. Therefore, active-active links from the dual-connected devices are supported even though they are connected to two different physical switches.

TIP

**MLAG or CLAG?** The Cumulus Linux implementation of MLAG is referred to by other vendors as CLAG, MC-LAG or VPC. You will even see references to CLAG in Cumulus Linux and Cumulus NetQ, including the management daemon, named `clagd`, and other options in the code, such as `clag-id`, which exist for historical purposes. The Cumulus Linux implementation is truly a multi-chassis link aggregation protocol, so we call it MLAG.

For instructions on configuring MLAG, refer to the MLAG topic in the Cumulus Linux User Guide.

With NetQ, you can view the configuration and operation of devices using MLAG using the `netq show clag` command. You can view the current configuration and the configuration at a prior point in time, as well as view any changes that have been made within a timeframe. The syntax for the show command is:

```
netq [<hostname>] show clag [around <text-time>] [json]
netq [<hostname>] show events [level info|level error|level warning|level critical|
level debug] type clag [between <text-time> and <text-endtime>] [json]
```

### View MLAG Configuration and Status for all Devices

This example shows the configuration and status of MLAG for all devices. In this case, three MLAG pairs are seen between leaf11 and leaf12 (which happens to be down), edge01(P) and edge02, and leaf21(P) and leaf22.

```
cumulus@switch:~$ netq show clag
Matching clag records:
Hostname          Peer              SysMac             State      Backup #Bond #Dual Last Changed
                                                                         s
----------------- ----------------- ------------------ ---------- ------ ----- ----- -------------------------
leaf11                              44:38:39:ff:ff:01  down       n/a    0     0     Thu Feb  7 18:30:49 2019
leaf12                              44:38:39:ff:ff:01  down       down   8     0     Thu Feb  7 18:30:53 2019
edge01(P)         edge02            00:01:01:10:00:01  up         up     25    25    Thu Feb  7 18:31:02 2019
edge02            edge01(P)         00:01:01:10:00:01  up         up     25    25    Thu Feb  7 18:31:15 2019
leaf21(P)         leaf22            44:38:39:ff:ff:02  up         up     8     8     Thu Feb  7 18:31:20 2019
leaf22            leaf21(P)         44:38:39:ff:ff:02  up         up     8     8     Thu Feb  7 18:31:30 2019
```

You can go back in time to see when this first MLAG pair went down. These results indicate that the pair became disconnected some time in the last five minutes.

```
cumulus@switch:~$ netq show clag around 5m
Matching clag records:
Hostname          Peer              SysMac             State      Backup #Bond #Dual Last Changed
                                                                         s
```

```
---------------- ---------------- ----------------- ---------- ------ ----- ----- ------------------------
edge01(P)       edge02          00:01:01:10:00:01  up       up    25    25    Thu Feb  7
18:31:30 2019
edge02          edge01(P)       00:01:01:10:00:01  up       up    25    25    Thu Feb  7
18:31:30 2019
leaf11(P)       leaf12          44:38:39:ff:ff:01  up       up    8     8     Thu Feb  7
18:31:30 2019
leaf12          leaf11(P)       44:38:39:ff:ff:01  up       up    8     8     Thu Feb  7
18:31:30 2019
leaf21(P)       leaf22          44:38:39:ff:ff:02  up       up    8     8     Thu Feb  7
18:31:30 2019
leaf22          leaf21(P)       44:38:39:ff:ff:02  up       up    8     8     Thu Feb  7
18:31:30 2019
```

### View MLAG Configuration and Status for Given Devices

This example shows that leaf22 is up and MLAG properly configured with a peer connection to leaf21 through 8 bonds, all of which are dual bonded.

```
cumulus@switch:~$ netq leaf22 show clag
Matching CLAG session records are:
Hostname        Peer            SysMac            State      Backup #Bond #Dual Last
Changed
                                                            s
---------------- ---------------- ----------------- ---------- ------ ----- ----- ------------------------
leaf22          leaf21(P)       44:38:39:ff:ff:02  up       up    8     8     Thu Feb  7
18:31:30 2019
```

When you're directly on the switch, you can run `clagctl` to get the state:

```
cumulus@switch:~$ sudo clagctl

The peer is alive
Peer Priority, ID, and Role: 4096 00:02:00:00:00:4e primary
Our Priority, ID, and Role: 8192 44:38:39:00:a5:38 secondary
Peer Interface and IP: peerlink-3.4094 169.254.0.9
VxLAN Anycast IP: 36.0.0.20
Backup IP: 27.0.0.20 (active)
System MAC: 44:38:39:ff:ff:01

CLAG Interfaces
Our Interface    Peer Interface   CLAG Id Conflicts          Proto-Down Reason
---------------- ---------------- ------- ------------------- -----------------
vx-38          vx-38          -     -               -
vx-33          vx-33          -     -               -
hostbond4      hostbond4      1     -               -
hostbond5      hostbond5      2     -               -
vx-37          vx-37          -     -               -
vx-36          vx-36          -     -               -
vx-35          vx-35          -     -               -
vx-34          vx-34          -     -               -
```

## Monitor Time Synchronization Status for Devices

It is important that the switches and hosts remain in time synchronization with the NetQ Platform to ensure collected data is properly captured and processed. You can use the `netq show ntp` command to view the time synchronization status for all devices or filter for devices that are either in synchronization or out of synchronization, currently or at a time in the past. The syntax for the show command is:

```
netq [<hostname>] show ntp [out-of-sync|in-sync] [around <text-time>] [json]
netq [<hostname>] show events [level info|level error|level warning|level critical|
level debug] type ntp [between <text-time> and <text-endtime>] [json]
```

This example shows the time synchronization status for all devices in the network.

```
cumulus@switch:~$ netq show ntp

Matching ntp records:
Hostname          NTP Sync Current Server    Stratum NTP App
----------------- -------- ----------------- ------- --------------------
edge01            yes      services01.it.c   3       ntpq
exit01            yes      time.tritn.com    2       ntpq
exit02            yes      time.tritn.com    2       ntpq
internet          no       -                 16      ntpq
leaf01            yes      services01.it.c   2       ntpq
leaf02            yes      services01.it.c   2       ntpq
leaf03            yes      107.181.191.189   2       ntpq
leaf04            yes      grom.polpo.org    2       ntpq
oob-mgmt-server   yes      linode227395.st   2       ntpq
server01          yes      192.168.0.254     3       ntpq
server02          yes      192.168.0.254     3       ntpq
server03          yes      192.168.0.254     3       ntpq
```

```
server04         yes      192.168.0.254     3       ntpq
spine01          yes      107.181.191.189   2       ntpq
spine02          yes      t2.time.bf1.yah   2       ntpq
```

This example shows all devices in the network that are out of time synchronization, and consequently might need to be investigated.

```
cumulus@switch:~$ netq show ntp out-of-sync

Matching ntp records:
Hostname          NTP Sync Current Server    Stratum NTP App
----------------- -------- ----------------- ------- ---------------------
internet          no       -                 16      ntpq
```

This example shows the time synchronization status for *leaf01*.

```
cumulus@switch:~$ netq leaf01 show ntp

Matching ntp records:
Hostname          NTP Sync Current Server    Stratum NTP App
----------------- -------- ----------------- ------- ---------------------
leaf01            yes      kilimanjaro       2       ntpq
```

## Monitor Spanning Tree Protocol Configuration

The Spanning Tree Protocol (STP) is used in Ethernet-based networks to prevent communication loops when you have redundant paths on a bridge or switch. Loops cause excessive broadcast messages greatly impacting the network performance. With NetQ, you can view the STP topology on a bridge or switch to ensure no loops have been created using the `netq show stp topology` command. You can also view the topology information for a prior point in time to see if any changes were made around then. The syntax for the show command is:

```
netq <hostname> show stp topology [around <text-time>] [json]
```

This example shows the STP topology as viewed from the *spine1* switch.

```
cumulus@switch:~$ netq spine1 show stp topology
Root(spine1) -- spine1:sw_clag200 -- leaf2:EdgeIntf(sng_hst2) -- hsleaf21
                                  -- leaf2:EdgeIntf(dual_host2) -- hdleaf2
                                  -- leaf2:EdgeIntf(dual_host1) -- hdleaf1
                                  -- leaf2:ClagIsl(peer-bond1) -- leaf1
                                  -- leaf1:EdgeIntf(sng_hst2) -- hsleaf11
                                  -- leaf1:EdgeIntf(dual_host2) -- hdleaf2
                                  -- leaf1:EdgeIntf(dual_host1) -- hdleaf1
                                  -- leaf1:ClagIsl(peer-bond1) -- leaf2
             -- spine1:ClagIsl(peer-bond1) -- spine2
             -- spine1:sw_clag300 -- edge1:EdgeIntf(sng_hst2) -- hsedge11
                                  -- edge1:EdgeIntf(dual_host2) -- hdedge2
                                  -- edge1:EdgeIntf(dual_host1) -- hdedge1
                                  -- edge1:ClagIsl(peer-bond1) -- edge2
```

```
                          -- edge2:EdgeIntf(sng_hst2) -- hsedge21
                          -- edge2:EdgeIntf(dual_host2) -- hdedge2
                          -- edge2:EdgeIntf(dual_host1) -- hdedge1
                          -- edge2:ClagIsl(peer-bond1) -- edge1
Root(spine2) -- spine2:sw_clag200 -- leaf2:EdgeIntf(sng_hst2) -- hsleaf21
                          -- leaf2:EdgeIntf(dual_host2) -- hdleaf2
                          -- leaf2:EdgeIntf(dual_host1) -- hdleaf1
                          -- leaf2:ClagIsl(peer-bond1) -- leaf1
                          -- leaf1:EdgeIntf(sng_hst2) -- hsleaf11
                          -- leaf1:EdgeIntf(dual_host2) -- hdleaf2
                          -- leaf1:EdgeIntf(dual_host1) -- hdleaf1
                          -- leaf1:ClagIsl(peer-bond1) -- leaf2
          -- spine2:ClagIsl(peer-bond1) -- spine1
          -- spine2:sw_clag300 -- edge2:EdgeIntf(sng_hst2) -- hsedge21
                          -- edge2:EdgeIntf(dual_host2) -- hdedge2
                          -- edge2:EdgeIntf(dual_host1) -- hdedge1
                          -- edge2:ClagIsl(peer-bond1) -- edge1
                          -- edge1:EdgeIntf(sng_hst2) -- hsedge11
                          -- edge1:EdgeIntf(dual_host2) -- hdedge2
                          -- edge1:EdgeIntf(dual_host1) -- hdedge1
                          -- edge1:ClagIsl(peer-bond1) -- edge2
```

## Validate Paths between Devices

If you have VLANs configured, you can view the available paths between two devices on the VLAN currently and at a time in the past using their MAC addresses . You can view the output in one of three formats (*json*, *pretty*, and *detail*). JSON output provides the output in a JSON file format for ease of importing to other applications or software. Pretty output lines up the paths in a pseudo-graphical manner to help visualize multiple paths. Detail output is useful for traces with higher hop counts where the pretty output wraps lines, making it harder to interpret the results. The detail output displays a table with a row for each path.

To view the paths:

1. Identify the MAC address and VLAN ID for the destination device
2. Identify the IP address or hostname for the source device
3. Use the `netq trace` command to see the available paths between those devices.

The trace command syntax is:

```
netq trace <mac> [vlan <1-4096>] from (<src-hostname>|<ip-src>) [vrf <vrf>]
[around <text-time>] [json|detail|pretty] [debug]
```

> NOTE
>
> The syntax requires the destination device address first, `mac`, and then the source device address or hostname. Additionally, the `vlan` keyword-value pair is required for layer 2 traces even though the syntax indicates it is optional.
>
> The tracing function only knows about addresses that have already been learned. If you find that a path is invalid or incomplete, you may need to ping the identified device so that its address becomes known.

### View Paths between Two Switches with Pretty Output

This example shows the available paths between a top of rack switch, *tor-1*, and a server, *server11*. The request is to go through VLAN *1001* from the VRF *vrf1*. The results include a summary of the trace, including the total number of paths available, those with errors and warnings, and the MTU of the paths. In this case, the results are displayed in pseudo-graphical output.

```
cumulus@switch:~$ netq trace 00:02:00:00:00:02 vlan 1001 from leaf01 vrf vrf1
pretty
Number of Paths: 4
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 9152
 leaf01 vni: 34 uplink-2 -- downlink-5 spine02 downlink-2 -- uplink-2 vni: 34 leaf12
hostbond4 -- swp2 server11
             uplink-2 -- downlink-5 spine02 downlink-1 -- uplink-2 vni: 34 leaf11
hostbond4 -- swp1 server11
 leaf01 vni: 34 uplink-1 -- downlink-5 spine01 downlink-2 -- uplink-1 vni: 34 leaf12
hostbond4 -- swp2 server11
             uplink-1 -- downlink-5 spine01 downlink-1 -- uplink-1 vni: 34 leaf11
hostbond4 -- swp1 server11
```

Alternately, you can use the IP address of the source device, as shown in this example.

```
cumulus@redis-1:~$  netq trace 00:02:00:00:00:02 vlan 1001 from 10.0.0.8 vrf vrf1
pretty
Number of Paths: 4
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 9152
```

```
 server11 swp1 -- swp5 <vlan1000> tor-1 <vlan1001> vni: 34 uplink-2 -- downlink-5
spine02 downlink-2 -- uplink-2 vni: 34 <vlan1001> leaf12 hostbond4 -- swp2
server11
                                             uplink-2 -- downlink-5 spine02 downlink-1 --
uplink-2 vni: 34 <vlan1001> leaf11 hostbond4 -- swp1 server11
        swp1 -- swp5 <vlan1000> tor-1 <vlan1001> vni: 34 uplink-1 -- downlink-5
spine01 downlink-2 -- uplink-1 vni: 34 <vlan1001> leaf12 hostbond4 -- swp2
server11
                                             uplink-1 -- downlink-5 spine01 downlink-1 --
uplink-1 vni: 34 <vlan1001> leaf11 hostbond4 -- swp1 server11
```

### View Paths between Two Switches with Detailed Output

This example provides the same path information as the pretty output, but displays the information in a tabular output.

```
cumulus@switch:~$ netq trace 00:02:00:00:00:02 vlan 1001 from 10.0.0.8 vrf vrf1
detail
Number of Paths: 4
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 9152
Id  Hop Hostname       InPort         InVlan InTunnel            InRtrIf        InVRF
OutRtrIf        OutVRF         OutTunnel           OutPort        OutVlan
--- --- -------------- -------------- ------ ------------------- -------------- -------------- --------------
-------------- ------------------- -------------- -------
1   1
server11
swp1           1000
```

```
    2   leaf01        swp5          1000                    vlan1000      vrf1
vlan1001       vrf1          vni: 34            uplink-2
    3   spine02       downlink-5                            downlink-5     default
downlink-2     default                          downlink-2
    4   leaf12        uplink-2            vni: 34            vlan1001
vrf1                                              hostbond4      1001
    5   server11      swp2
--- --- -------------- -------------- ------ ------------------- -------------- -------------- --------------
-------------- ------------------- -------------- -------
2   1
server11
swp1           1000
    2   leaf01        swp5          1000                    vlan1000      vrf1
vlan1001       vrf1          vni: 34            uplink-2
    3   spine02       downlink-5                            downlink-5     default
downlink-1     default                          downlink-1
    4   leaf11        uplink-2            vni: 34            vlan1001
vrf1                                              hostbond4      1001
    5   server11      swp1
--- --- -------------- -------------- ------ ------------------- -------------- -------------- --------------
-------------- ------------------- -------------- -------
3   1
server11
swp1           1000
    2   leaf01        swp5          1000                    vlan1000      vrf1
vlan1001       vrf1          vni: 34            uplink-1
    3   spine01       downlink-5                            downlink-5     default
downlink-2     default                          downlink-2
    4   leaf12        uplink-1            vni: 34            vlan1001
```

```
vrf1                                              hostbond4     1001
   5   server11       swp2
--- --- --------------- --------------- ------ --------------------- --------------- --------------- ---------------
--------------- --------------------- --------------- -------
4   1
server11
swp1          1000
   2   leaf01         swp5          1000                    vlan1000      vrf1
vlan1001      vrf1          vni: 34            uplink-1
   3   spine01        downlink-5                            downlink-5     default
downlink-1     default                          downlink-1
   4   leaf11         uplink-1            vni: 34            vlan1001
vrf1                                              hostbond4     1001
   5   server11       swp1
--- --- --------------- --------------- ------ --------------------- --------------- --------------- ---------------
--------------- --------------------- --------------- -------
```

# Monitor Network Layer Protocols

With NetQ, a network administrator can monitor OSI Layer 3 network protocols running on Linux-based hosts, including IP (Internet Protocol), BGP (Border Gateway Protocol) and OSPF (Open Shortest Path First). NetQ provides the ability to:

- Validate protocol configurations
- Validate layer 3 communication paths

It helps answer questions such as:

- Who are the IP neighbors for a switch?
- How many IPv4 and IPv6 addresses am I using?
- When did changes occur to my IP configuration?
- Is BGP working as expected?
- Is OSPF working as expected?
- Can device A reach device B using IP addresses?

## Monitor IP Configuration

NetQ enables you to view the current status and the status an earlier point in time. From this information, you can:

- determine IP addresses of one or more interfaces
- determine IP neighbors for one or more devices
- determine IP routes owned by a device
- identify changes to the IP configuration

The `netq show ip` command is used to obtain the address, neighbor, and route information from the devices. Its syntax is:

```
netq <hostname> show ip addresses [<remote-interface>] [<ipv4>|<ipv4/prefixlen>] [vrf <vrf>] [around <text-time>] [count] [json]
netq [<hostname>] show ip addresses [<remote-interface>] [<ipv4>|<ipv4/prefixlen>] [vrf <vrf>] [around <text-time>] [json]
netq <hostname> show ip neighbors [<remote-interface>] [<ipv4>|<ipv4> vrf <vrf>|vrf <vrf>] [<mac>] [around <text-time>] [json]
netq [<hostname>] show ip neighbors [<remote-interface>] [<ipv4>|<ipv4> vrf <vrf>|vrf <vrf>] [<mac>] [around <text-time>] [count] [json]
netq <hostname> show ip routes [<ipv4>|<ipv4/prefixlen>] [vrf <vrf>] [origin] [around <text-time>] [count] [json]
netq [<hostname>] show ip routes [<ipv4>|<ipv4/prefixlen>] [vrf <vrf>] [origin] [around <text-time>] [json]

netq <hostname> show ipv6 addresses [<remote-interface>] [<ipv6>|<ipv6/prefixlen>] [vrf <vrf>] [around <text-time>] [count] [json]
netq [<hostname>] show ipv6 addresses [<remote-interface>] [<ipv6>|<ipv6/prefixlen>] [vrf <vrf>] [around <text-time>] [json]
netq <hostname> show ipv6 neighbors [<remote-interface>] [<ipv6>|<ipv6> vrf <vrf>|vrf <vrf>] [<mac>] [around <text-time>] [count] [json]
netq [<hostname>] show ipv6 neighbors [<remote-interface>] [<ipv6>|<ipv6> vrf <vrf>|vrf <vrf>] [<mac>] [around <text-time>] [json]
netq <hostname> show ipv6 routes [<ipv6>|<ipv6/prefixlen>] [vrf <vrf>] [origin] [around <text-time>] [count] [json]
netq [<hostname>] show ipv6 routes [<ipv6>|<ipv6/prefixlen>] [vrf <vrf>] [origin] [around <text-time>] [json]
```

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the `<text-time>` is the most recent time and the `<text-endtime>` is the oldest time. The values do not have to have the same unit of measure.

### View IP Address Information

You can view the IPv4 and IPv6 address information for all of your devices, including the interface and VRF for each device. Additionally, you can:

- view the information at an earlier point in time
- filter against a particular device, interface or VRF assignment
- obtain a count of all of the addresses

Each of these provides information for troubleshooting potential configuration and communication issues at the layer 3 level.

**Example: View IPv4 address information for all devices**

```
cumulus@switch:~$ netq show ip addresses
Matching address records:
Address                   Hostname          Interface                 VRF             Last Changed
------------------------- ----------------- ------------------------- --------------- -------------------------
10.0.0.11/32              leaf01            lo                        default         Thu Feb  7 18:30:53
2019
10.0.0.12/32              leaf02            lo                        default         Thu Feb  7 18:30:53
2019
10.0.0.13/32              leaf03            lo                        default         Thu Feb  7 18:30:53
2019
10.0.0.14/32              leaf04            lo                        default         Thu Feb  7 18:30:53
2019
10.0.0.21/32              spine01           lo                        default         Thu Feb  7 18:30:53
2019
10.0.0.22/32              spine02           lo                        default         Thu Feb  7 18:30:53
2019
10.0.0.254/32             oob-mgmt-server   eth0                      default         Thu Feb  7
18:30:53 2019
172.16.1.1/24             leaf01            br0                       default         Thu Feb  7 18:30:53
2019
172.16.1.101/24           server01          eth1                      default         Thu Feb  7
18:30:53 2019
172.16.2.1/24             leaf02            br0                       default         Thu Feb  7 18:30:53
2019
172.16.2.101/24           server02          eth2                      default         Thu Feb  7
18:30:53 2019
172.16.3.1/24             leaf03            br0                       default         Thu Feb  7 18:30:53
2019
172.16.3.101/24           server03          eth1                      default         Thu Feb  7
```

```
18:30:53 2019
172.16.4.1/24            leaf04           br0                    default         Thu Feb  7 18:30:53
2019
172.16.4.101/24          server04         eth2                   default         Thu Feb  7
18:30:53 2019
172.17.0.1/16            oob-mgmt-server  docker0                default         Thu Feb  7
18:30:53 2019
192.168.0.11/24          leaf01           eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.12/24          leaf02           eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.13/24          leaf03           eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.14/24          leaf04           eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.21/24          spine01          eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.22/24          spine02          eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.254/24         oob-mgmt-server  eth1                   default         Thu Feb  7
18:30:53 2019
192.168.0.31/24          server01         eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.32/24          server02         eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.33/24          server03         eth0                   default         Thu Feb  7
18:30:53 2019
192.168.0.34/24          server04         eth0                   default         Thu Feb  7
18:30:53 2019
```

**Example: View IPv6 address information for all devices**

```
cumulus@switch:~$ netq show ipv6 addresses
Matching address records:
Address                  Hostname          Interface                 VRF             Last Changed
------------------------ ----------------- ------------------------- --------------- ------------------------
fe80::203:ff:fe11:1101/64 server01         eth1                      default         Thu Feb  7
18:30:53 2019
fe80::203:ff:fe22:2202/64 server02         eth2                      default         Thu Feb  7
18:30:53 2019
fe80::203:ff:fe33:3301/64 server03         eth1                      default         Thu Feb  7
18:30:53 2019
fe80::203:ff:fe44:4402/64 server04         eth2                      default         Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:18/6 leaf02           br0                       default         Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:1b/6 leaf03           swp52                     default         Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:1c/6 spine02          swp3                      default         Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:23/6 leaf03           br0                       default         Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:24/6 leaf01           swp52                     default         Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:25/6 spine02          swp1                      default         Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:28/6 leaf02           swp51                     default         Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:29/6 spine01          swp2                      default         Thu Feb  7
```

```
18:30:53 2019
fe80::4638:39ff:fe00:2c/6 leaf04          br0               default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:3/64 leaf01          br0               default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:3b/6 leaf04          swp51             default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:3c/6 spine01         swp4              default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:46/6 leaf04          swp52             default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:47/6 spine02         swp4              default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:4f/6 leaf03          swp51             default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:50/6 spine01         swp3              default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:53/6 leaf01          swp51             default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:54/6 spine01         swp1              default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:57/6 oob-mgmt-server   eth1              default       Thu Feb
7 18:30:53 2019
fe80::4638:39ff:fe00:5d/6 leaf02          swp52             default       Thu Feb  7
18:30:53 2019
fe80::4638:39ff:fe00:5e/6 spine02         swp2              default       Thu Feb  7
18:30:53 2019
fe80::5054:ff:fe77:c277/6 oob-mgmt-server   eth0              default       Thu Feb
7 18:30:53 2019
```

```
fe80::a200:ff:fe00:11/64  leaf01        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:12/64  leaf02        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:13/64  leaf03        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:14/64  leaf04        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:21/64  spine01        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:22/64  spine02        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:31/64  server01        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:32/64  server02        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:33/64  server03        eth0             default      Thu Feb  7
18:30:53 2019
fe80::a200:ff:fe00:34/64  server04        eth0             default      Thu Feb  7
18:30:53 2019
```

**Example: Filter IP Address Information for a Specific Interface**

This example shows the IPv4 address information for the eth0 interface on all devices.

```
cumulus@switch:~$ netq show ip addresses eth0
Matching address records:
Address              Hostname        Interface            VRF          Last Changed
```

```
------------------------ ----------------- ------------------------ --------------- ------------------------
10.0.0.254/32            oob-mgmt-server   eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.11/24          leaf01            eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.12/24          leaf02            eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.13/24          leaf03            eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.14/24          leaf04            eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.21/24          spine01           eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.22/24          spine02           eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.31/24          server01          eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.32/24          server02          eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.33/24          server03          eth0                      default         Thu Feb  7
18:30:53 2019
192.168.0.34/24          server04          eth0                      default         Thu Feb  7
18:30:53 2019
```

**Example: Filter IP Address Information for a Specific Device**

This example shows the IPv6 address information for the leaf01 switch.

```
cumulus@switch:~$ netq leaf01 show ipv6 addresses
Matching address records:
Address                   Hostname          Interface                 VRF             Last Changed
------------------------- ----------------- ------------------------- --------------- -------------------------
2001:c15c:d06:f00d::16/12 leaf01            lo                        default         Fri Feb  8
00:35:07 2019
8
2001:cafe:babe:0:22::/128 leaf01            DataVrf1080               DataVrf1080     Fri Feb
8 00:35:07 2019
2001:cafe:babe:1:22::/128 leaf01            DataVrf1081               DataVrf1081     Fri Feb
8 00:35:07 2019
2001:cafe:babe:2:22::/128 leaf01            DataVrf1082               DataVrf1082     Fri Feb
8 00:35:07 2019
2001:fee1:600d:10::1/64   leaf01            VlanA-1.102               DataVrf1082     Fri Feb
8 00:35:07 2019
2001:fee1:600d:11::1/64   leaf01            VlanA-1.103               default         Fri Feb  8
00:35:07 2019
2001:fee1:600d:12::1/64   leaf01            VlanA-1.104               default         Fri Feb  8
00:35:07 2019
2001:fee1:600d:13::1/64   leaf01            VlanA-1.105               default         Fri Feb  8
00:35:07 2019
2001:fee1:600d:14::1/64   leaf01            VlanA-1.106               default         Fri Feb  8
00:35:07 2019
2001:fee1:600d:e::1/64    leaf01            VlanA-1.100               DataVrf1080     Fri Feb  8
00:35:07 2019
2001:fee1:600d:f::1/64    leaf01            VlanA-1.101               DataVrf1081     Fri Feb  8
00:35:07 2019
2001:fee1:d00d:1::1/64    leaf01            vlan1001-v0               vrf1            Fri Feb  8
00:35:07 2019
```

```
2001:fee1:d00d:1::2/64    leaf01        vlan1001            vrf1        Fri Feb  8
00:35:07 2019
2001:fee1:d00d:2::1/64    leaf01        vlan1002-v0          vrf1        Fri Feb  8
00:35:07 2019
```

#### Example: View Changes to IP Address Information

This example shows the IPv4 address information that changed for all devices around 1 day ago.

```
cumulus@switch:~$ netq show ip addresses around 1d
Matching address records:
Address               Hostname        Interface            VRF         Last Changed
------------------------ ----------------- ------------------------ --------------- -------------------------
192.168.0.15/24        leaf01        eth0                mgmt        Thu Feb  7
22:49:26 2019
27.0.0.22/32          leaf01        lo                  default       Thu Feb  7 22:49:26
2019
3.0.3.129/26          leaf01        VlanA-1.100           DataVrf1080    Thu Feb  7
22:49:26 2019
3.0.3.193/26          leaf01        VlanA-1.101           DataVrf1081    Thu Feb  7
22:49:26 2019
3.0.4.1/26            leaf01        VlanA-1.102           DataVrf1082    Thu Feb  7
22:49:26 2019
3.0.4.129/26          leaf01        VlanA-1.104           default       Thu Feb  7
22:49:26 2019
3.0.4.193/26          leaf01        VlanA-1.105           default       Thu Feb  7
22:49:26 2019
```

```
3.0.4.65/26              leaf01           VlanA-1.103              default          Thu Feb  7
22:49:26 2019
3.0.5.1/26               leaf01           VlanA-1.106              default          Thu Feb  7
22:49:26 2019
30.0.0.22/32             leaf01           DataVrf1080              DataVrf1080      Thu Feb  7
22:49:26 2019
30.0.1.22/32             leaf01           DataVrf1081              DataVrf1081      Thu Feb  7
22:49:26 2019
30.0.2.22/32             leaf01           DataVrf1082              DataVrf1082      Thu Feb  7
22:49:26 2019
45.0.0.13/26             leaf01           NetQBond-1               mgmt             Thu Feb  7
22:49:26 2019
6.0.0.1/26               leaf01           vlan1000-v0              vrf1             Thu Feb  7 22:49:26
2019
6.0.0.129/26             leaf01           vlan1002-v0              vrf1             Thu Feb  7
22:49:26 2019
```

**Example: Obtain a Count of IP Addresses Used on a Node**

This example shows the number of IPv4 and IPv6 addresses on the node leaf01. Note that you must specify a hostname to use the count option.

```
cumulus@switch:~$ netq leaf01 show ip addresses count
Count of matching address records: 33

cumulus@switch:~$ netq leaf01 show ipv6 addresses count
Count of matching address records: 42
```

### View IP Neighbor Information

You can view the IPv4 and IPv6 neighbor information for all of your devices, including the interface port, MAC address, VRF assignment, and whether it learns the MAC address from the peer (remote=yes). Additionally, you can:

- view the information at an earlier point in time
- filter against a particular device, interface, address or VRF assignment
- obtain a count of all of the addresses

Each of these provides information for troubleshooting potential configuration and communication issues at the layer 3 level.

**Example: View IPv4 Neighbor Information for All Devices**

```
cumulus@switch:~$ netq show ip neighbors
Matching neighbor records:
IP Address                Hostname          Interface                 MAC Address        VRF
Remote Last Changed
------------------------- ----------------- ------------------------- ------------------ --------------- ------
-------------------------
10.255.5.1                oob-mgmt-server   eth0                      52:54:00:0f:79:30
default          no     Thu Feb  7 22:49:26 2019
169.254.0.1               leaf01            swp51                     44:38:39:00:00:54  default
no     Thu Feb  7 22:49:26 2019
169.254.0.1               leaf01            swp52                     44:38:39:00:00:25  default
no     Thu Feb  7 22:49:26 2019
169.254.0.1               leaf02            swp51                     44:38:39:00:00:29  default
no     Thu Feb  7 22:49:26 2019
169.254.0.1               leaf02            swp52                     44:38:39:00:00:5e  default
no     Thu Feb  7 22:49:26 2019
```

```
169.254.0.1              leaf03           swp51                   44:38:39:00:00:50  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              leaf03           swp52                   44:38:39:00:00:1c  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              leaf04           swp51                   44:38:39:00:00:3c  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              leaf04           swp52                   44:38:39:00:00:47  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              spine01          swp1                    44:38:39:00:00:53  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              spine01          swp2                    44:38:39:00:00:28  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              spine01          swp3                    44:38:39:00:00:4f  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              spine01          swp4                    44:38:39:00:00:3b  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              spine02          swp1                    44:38:39:00:00:24  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              spine02          swp2                    44:38:39:00:00:5d  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              spine02          swp3                    44:38:39:00:00:1b  default
no      Thu Feb  7 22:49:26 2019
169.254.0.1              spine02          swp4                    44:38:39:00:00:46  default
no      Thu Feb  7 22:49:26 2019
192.168.0.11             oob-mgmt-server   eth1                   a0:00:00:00:00:11
default         no      Thu Feb  7 22:49:26 2019
192.168.0.12             oob-mgmt-server   eth1                   a0:00:00:00:00:12
default         no      Thu Feb  7 22:49:26 2019
192.168.0.13             oob-mgmt-server   eth1                   a0:00:00:00:00:13
```

```
default     no    Thu Feb  7 22:49:26 2019
192.168.0.14          oob-mgmt-server  eth1              a0:00:00:00:00:14
default     no    Thu Feb  7 22:49:26 2019
192.168.0.21          oob-mgmt-server  eth1              a0:00:00:00:00:21
default     no    Thu Feb  7 22:49:26 2019
192.168.0.22          oob-mgmt-server  eth1              a0:00:00:00:00:22
default     no    Thu Feb  7 22:49:26 2019
192.168.0.253         oob-mgmt-server  eth1              a0:00:00:00:00:50
default     no    Thu Feb  7 22:49:26 2019
192.168.0.254         leaf01           eth0              44:38:39:00:00:57  default
no    Thu Feb  7 22:49:26 2019
192.168.0.254         leaf02           eth0              44:38:39:00:00:57  default
no    Thu Feb  7 22:49:26 2019
...
```

**Example: View IPv6 Neighbor Information for a Given Device**

This example shows the IPv6 neighbors for leaf02 switch.

```
cumulus@switch$ netq leaf02 show ipv6 neighbors
Matching neighbor records:
IP Address              Hostname         Interface                 MAC Address        VRF
Remote Last Changed
------------------------ ---------------- ------------------------ ------------------ --------------- ------
------------------------
fe80::203:ff:fe22:2202   leaf02           br0                      00:03:00:22:22:02
default     no    Thu Feb  7 22:49:26 2019
fe80::4638:39ff:fe00:29  leaf02           swp51                    44:38:39:00:00:29
```

```
default       no    Thu Feb  7 22:49:26 2019
fe80::4638:39ff:fe00:4    leaf02         eth0               44:38:39:00:00:04
default       no    Thu Feb  7 22:49:26 2019
fe80::4638:39ff:fe00:5e   leaf02         swp52               44:38:39:00:00:5e
default       no    Thu Feb  7 22:49:26 2019
fe80::a200:ff:fe00:31     leaf02         eth0               a0:00:00:00:00:31
default       no    Thu Feb  7 22:49:26 2019
fe80::a200:ff:fe00:32     leaf02         eth0               a0:00:00:00:00:32
default       no    Thu Feb  7 22:49:26 2019
fe80::a200:ff:fe00:33     leaf02         eth0               a0:00:00:00:00:33
default       no    Thu Feb  7 22:49:26 2019
fe80::a200:ff:fe00:34     leaf02         eth0               a0:00:00:00:00:34
default       no    Thu Feb  7 22:49:26 2019
```

### View IP Routes Information

You can view the IPv4 and IPv6 routes for all of your devices, including the IP address (with or without mask), the destination (by hostname) of the route, next hops available, VRF assignment, and whether a host is the owner of the route or MAC address. Additionally, you can:

- view the information at an earlier point in time
- filter against a particular address or VRF assignment
- obtain a count of all of the routes

Each of these provides information for troubleshooting potential configuration and communication issues at the layer 3 level.

**Example: View IP Routes for All Devices**

This example shows the IPv4 and IPv6 routes for all devices in the network.

```
cumulus@switch:~$ netq show ipv6 routes
Matching routes records:
Origin VRF          Prefix                    Hostname         Nexthops                    Last
Changed
------ -------------- ---------------------------- ---------------- ----------------------------------
------------------------
yes    default        ::/0                     server04         lo                          Thu Feb  7
22:49:26 2019
yes    default        ::/0                     server03         lo                          Thu Feb  7
22:49:26 2019
yes    default        ::/0                     server01         lo                          Thu Feb  7
22:49:26 2019
yes    default        ::/0                     server02         lo                          Thu Feb  7
22:49:26 2019

cumulus@switch:~$ netq show ip routes
Matching routes records:
Origin VRF          Prefix                    Hostname         Nexthops                    Last
Changed
------ -------------- ---------------------------- ---------------- ----------------------------------
------------------------
yes    DataVrf1080    3.0.3.128/26             leaf01           VlanA-1.100
Fri Feb  8 00:46:17 2019
yes    DataVrf1080    3.0.3.129/32             leaf01           VlanA-1.100
Fri Feb  8 00:46:17 2019
yes    DataVrf1080    30.0.0.22/32             leaf01           DataVrf1080
Fri Feb  8 00:46:17 2019
yes    DataVrf1081    3.0.3.192/26             leaf01           VlanA-1.101
Fri Feb  8 00:46:17 2019
```

```
yes    DataVrf1081    3.0.3.193/32             leaf01         VlanA-1.101
Fri Feb  8 00:46:17 2019
yes    DataVrf1081    30.0.1.22/32             leaf01         DataVrf1081
Fri Feb  8 00:46:17 2019
yes    DataVrf1082    3.0.4.0/26               leaf01         VlanA-1.102
Fri Feb  8 00:46:17 2019
yes    DataVrf1082    3.0.4.1/32               leaf01         VlanA-1.102
Fri Feb  8 00:46:17 2019
yes    DataVrf1082    30.0.2.22/32             leaf01         DataVrf1082
Fri Feb  8 00:46:17 2019
yes    default        27.0.0.22/32             leaf01         lo                        Fri Feb
8 00:46:17 2019
yes    default        3.0.4.128/26             leaf01         VlanA-1.104               Fri
Feb  8 00:46:17 2019
yes    default        3.0.4.129/32             leaf01         VlanA-1.104               Fri
Feb  8 00:46:17 2019
yes    default        3.0.4.192/26             leaf01         VlanA-1.105               Fri
Feb  8 00:46:17 2019
yes    default        3.0.4.193/32             leaf01         VlanA-1.105               Fri
Feb  8 00:46:17 2019
...
```

**Example: View IP Routes for a Given IP Address**

This example shows the routes available for an IP address of 10.0.0.12.

```
cumulus@switch:~$ netq show ip routes 10.0.0.12
Matching routes records:
```

```
Origin VRF          Prefix                    Hostname         Nexthops                          Last
Changed
------ --------------- ----------------------------- ----------------- -----------------------------------
-------------------------
no     default         10.0.0.12/32              leaf03           10.0.0.21: swp51, 10.0.0.22:
swp52  Fri Feb  8 00:46:17 2019
no     default         10.0.0.12/32              leaf01           10.0.0.21: swp51, 10.0.0.22:
swp52  Fri Feb  8 00:46:17 2019
no     default         10.0.0.12/32              leaf04           10.0.0.21: swp51, 10.0.0.22:
swp52  Fri Feb  8 00:46:17 2019
no     default         10.0.0.12/32              spine02           10.0.0.12: swp2
Fri Feb  8 00:46:17 2019
no     default         10.0.0.12/32              spine01           10.0.0.12: swp2
Fri Feb  8 00:46:17 2019
yes    default         10.0.0.12/32              leaf02           lo                            Fri Feb
8 00:46:17 2019
```

**Example: View IP Routes Owned by a Given Device**

This example shows the IPv4 routes that are owned by spine01 switch.

```
cumulus@switch:~$ netq spine01 show ip routes origin
Matching routes records:
Origin VRF          Prefix                    Hostname         Nexthops                          Last
Changed
------ --------------- ----------------------------- ----------------- -----------------------------------
-------------------------
yes    default         10.0.0.21/32              spine01           lo                            Fri Feb
```

```
8 00:46:17 2019
yes    default        192.168.0.0/24            spine01         eth0                        Fri
Feb  8 00:46:17 2019
yes    default        192.168.0.21/32           spine01         eth0                        Fri
Feb  8 00:46:17 2019
```

**Example: View IP Routes for a Given Device at a Prior Time**

This example show the IPv4 routes for spine01 switch about 24 hours ago.

```
cumulus@switch:~$ netq spine01 show ip routes around 24h
Matching routes records:
Origin VRF          Prefix                      Hostname        Nexthops                            Last
Changed
------ -------------- ---------------------------- ---------------- ----------------------------------
------------------------
no     default        10.0.0.11/32              spine01         169.254.0.1: swp1
Fri Feb  8 00:46:17 2019
no     default        10.0.0.12/32              spine01         169.254.0.1: swp2
Fri Feb  8 00:46:17 2019
no     default        10.0.0.13/32              spine01         169.254.0.1: swp3
Fri Feb  8 00:46:17 2019
no     default        10.0.0.14/32              spine01         169.254.0.1: swp4
Fri Feb  8 00:46:17 2019
no     default        172.16.1.0/24             spine01         169.254.0.1: swp1
Fri Feb  8 00:46:17 2019
no     default        172.16.2.0/24             spine01         169.254.0.1: swp2
Fri Feb  8 00:46:17 2019
```

```
no     default        172.16.3.0/24              spine01         169.254.0.1: swp3
Fri Feb  8 00:46:17 2019
no     default        172.16.4.0/24              spine01         169.254.0.1: swp4
Fri Feb  8 00:46:17 2019
yes    default        10.0.0.21/32               spine01         lo                        Fri Feb
8 00:46:17 2019
yes    default        192.168.0.0/24             spine01         eth0                      Fri
Feb  8 00:46:17 2019
yes    default        192.168.0.21/32            spine01         eth0                      Fri
Feb  8 00:46:17 2019
```

**Example: View the Number of IP Routes on a Node**

This example shows the total number of IP routes for all devices on a node.

```
cumulus@switch:~$ netq leaf01 show ip routes count
Count of matching routes records: 125

cumulus@switch:~$ netq leaf01 show ipv6 routes count
Count of matching routes records: 5
```

## Monitor BGP Configuration

If you have BGP running on your switches and hosts, you can monitor its operation using the NetQ CLI. For each device, you can view its associated neighbors, ASN (autonomous system number), peer ASN, receive IP or EVPN address prefixes, and VRF assignment. Additionally, you can:

- view the information at an earlier point in time
- filter against a particular device, ASN, or VRF assignment
- validate it is operating correctly across the network

The `netq show bgp` command is used to obtain the BGP configuration information from the devices. The `netq check bgp` command is used to validate the configuration. The syntax of these commands is:

```
netq [<hostname>] show bgp [<bgp-session>|asn <number-asn>] [vrf <vrf>]
[around <text-time>] [json]
netq [<hostname>] show events [level info|level error|level warning|level critical|
level debug] type bgp [between <text-time> and <text-endtime>] [json]
netq check bgp [vrf <vrf>] [around <text-time>] [json]
```

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the `<text-time>` is the most recent time and the `<text-endtime>` is the oldest time. The values do not have to have the same unit of measure.

### View BGP Configuration Information

NetQ enables you to view the BGP configuration of a single device or across all of your devices at once. You can filter the results based on an ASN, BGP session (IP address or interface name), or VRF assignment. You can view the configuration in the past and view changes made to the configuration within a given timeframe.

**Example: View BGP Configuration Information Across Network**

This example shows the BGP configuration across all of your switches. In this scenario, BGP routing is configured between two spines and four leafs. Each leaf switch has a unique ASN and the spine switches share an ASN. The PfxRx column indicates that these devices have IPv4 address prefixes. The second and third values in this column indicate IPv6 and EVPN address prefixes when configured. This configuration was changed just over one day ago.

```
cumulus@switch:~$ netq show bgp
Matching bgp records:
Hostname          Neighbor                     VRF              ASN        Peer ASN   PfxRx        Last
Changed
----------------- --------------------------- --------------- ---------- ---------- ------------
------------------------
exit-1            swp3(spine-1)                default          655537     655435     29/25/434
Thu Feb  7 18:19:50 2019
exit-1            swp3.2(spine-1)              DataVrf1080      655537     655435     15/13/0
Thu Feb  7 18:19:50 2019
exit-1            swp3.3(spine-1)              DataVrf1081      655537     655435     14/13/0
Thu Feb  7 18:19:50 2019
exit-1            swp3.4(spine-1)              DataVrf1082      655537     655435     16/13/0
Thu Feb  7 18:19:50 2019
exit-1            swp4(spine-2)                default          655537     655435     29/25/434
Thu Feb  7 18:19:50 2019
exit-1            swp4.2(spine-2)              DataVrf1080      655537     655435     16/13/0
Thu Feb  7 18:19:50 2019
exit-1            swp4.3(spine-2)              DataVrf1081      655537     655435     14/13/0
Thu Feb  7 18:19:50 2019
exit-1            swp4.4(spine-2)              DataVrf1082      655537     655435     16/13/0
Thu Feb  7 18:19:50 2019
exit-1            swp5(spine-3)                default          655537     655435     30/25/434
Thu Feb  7 18:19:50 2019
exit-1            swp5.2(spine-3)              DataVrf1080      655537     655435     15/13/0
Thu Feb  7 18:19:50 2019
exit-1            swp5.3(spine-3)              DataVrf1081      655537     655435     14/13/0
Thu Feb  7 18:19:50 2019
exit-1            swp5.4(spine-3)              DataVrf1082      655537     655435     16/13/0
```

```
Thu Feb  7 18:19:50 2019
exit-1            swp7                      default         655537     -          NotEstd      Thu Feb  7
18:31:44 2019
exit-1            swp7.2                    DataVrf1080     655537     -          NotEstd      Thu
Feb  7 18:31:44 2019
exit-1            swp7.3                    DataVrf1081     655537     -          NotEstd      Thu
Feb  7 18:31:44 2019
exit-1            swp7.4                    DataVrf1082     655537     -          NotEstd      Thu
Feb  7 18:31:44 2019
exit-2            swp3(spine-1)             default         655538     655435     28/24/434
Thu Feb  7 18:19:50 2019
exit-2            swp3.2(spine-1)           DataVrf1080     655538     655435     14/12/0
Thu Feb  7 18:19:50 2019
exit-2            swp3.3(spine-1)           DataVrf1081     655538     655435     15/12/0
Thu Feb  7 18:19:50 2019
exit-2            swp3.4(spine-1)           DataVrf1082     655538     655435     15/12/0
Thu Feb  7 18:19:50 2019
exit-2            swp4(spine-2)             default         655538     655435     28/24/434
Thu Feb  7 18:19:50 2019
exit-2            swp4.2(spine-2)           DataVrf1080     655538     655435     14/12/0
Thu Feb  7 18:19:50 2019
exit-2            swp4.3(spine-2)           DataVrf1081     655538     655435     15/12/0
Thu Feb  7 18:19:50 2019
exit-2            swp4.4(spine-2)           DataVrf1082     655538     655435     15/12/0
Thu Feb  7 18:19:50 2019
exit-2            swp5(spine-3)             default         655538     655435     27/24/434
Thu Feb  7 18:19:50 2019
exit-2            swp5.2(spine-3)           DataVrf1080     655538     655435     15/12/0
Thu Feb  7 18:19:50 2019
```

```
exit-2          swp5.3(spine-3)          DataVrf1081    655538    655435    15/12/0
Thu Feb  7 18:19:50 2019
exit-2          swp5.4(spine-3)          DataVrf1082    655538    655435    15/12/0
Thu Feb  7 18:19:50 2019
exit-2          swp7                     default        655538    -         NotEstd     Thu Feb  7
18:31:49 2019
exit-2          swp7.2                   DataVrf1080    655538    -         NotEstd     Thu
Feb  7 18:31:49 2019
exit-2          swp7.3                   DataVrf1081    655538    -         NotEstd     Thu
Feb  7 18:31:49 2019
exit-2          swp7.4                   DataVrf1082    655538    -         NotEstd     Thu
Feb  7 18:31:49 2019
spine-1         swp10(exit-2)            default        655435    655538    10/5/0      Thu
Feb  7 18:19:50 2019
spine-1         swp10.2(exit-2)          DataVrf1080    655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine-1         swp10.3(exit-2)          DataVrf1081    655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine-1         swp10.4(exit-2)          DataVrf1082    655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine-1         swp3(leaf-11)            default        655435    655559    19/6/94
Thu Feb  7 18:19:50 2019
spine-1         swp3.2(leaf-11)          DataVrf1080    655435    655559    14/2/0
Thu Feb  7 18:19:50 2019
spine-1         swp3.3(leaf-11)          DataVrf1081    655435    655559    14/2/0
Thu Feb  7 18:19:50 2019
spine-1         swp3.4(leaf-11)          DataVrf1082    655435    655559    14/2/0
Thu Feb  7 18:19:50 2019
spine-1         swp4(leaf-12)            default        655435    655560    19/6/64
```

```
Thu Feb  7 18:19:50 2019
spine-1          swp4.2(leaf-12)          DataVrf1080    655435    655560    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp4.3(leaf-12)          DataVrf1081    655435    655560    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp4.4(leaf-12)          DataVrf1082    655435    655560    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp5(leaf-21)            default        655435    655561    19/6/50
Thu Feb  7 18:19:50 2019
spine-1          swp5.2(leaf-21)          DataVrf1080    655435    655561    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp5.3(leaf-21)          DataVrf1081    655435    655561    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp5.4(leaf-21)          DataVrf1082    655435    655561    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp6(leaf-22)            default        655435    655562    19/6/62
Thu Feb  7 18:19:50 2019
spine-1          swp6.2(leaf-22)          DataVrf1080    655435    655562    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp6.3(leaf-22)          DataVrf1081    655435    655562    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp6.4(leaf-22)          DataVrf1082    655435    655562    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp7(leaf-1)             default        655435    655557    17/5/54    Thu
Feb  7 18:19:50 2019
spine-1          swp7.2(leaf-1)           DataVrf1080    655435    655557    14/2/0
Thu Feb  7 18:19:50 2019
spine-1          swp7.3(leaf-1)           DataVrf1081    655435    655557    14/2/0
Thu Feb  7 18:19:50 2019
```

```
spine-1           swp7.4(leaf-1)            DataVrf1082     655435     655557     14/2/0
Thu Feb  7 18:19:50 2019
spine-1           swp8(leaf-2)              default         655435     655558     17/5/54     Thu
Feb  7 18:19:50 2019
spine-1           swp8.2(leaf-2)            DataVrf1080     655435     655558     14/2/0
Thu Feb  7 18:19:50 2019
spine-1           swp8.3(leaf-2)            DataVrf1081     655435     655558     14/2/0
Thu Feb  7 18:19:50 2019
spine-1           swp8.4(leaf-2)            DataVrf1082     655435     655558     14/2/0
Thu Feb  7 18:19:50 2019
spine-1           swp9(exit-1)              default         655435     655537     19/5/0      Thu
Feb  7 18:19:50 2019
spine-1           swp9.2(exit-1)            DataVrf1080     655435     655537     19/5/0
Thu Feb  7 18:19:50 2019
spine-1           swp9.3(exit-1)            DataVrf1081     655435     655537     19/5/0
Thu Feb  7 18:19:50 2019
spine-1           swp9.4(exit-1)            DataVrf1082     655435     655537     19/5/0
Thu Feb  7 18:19:50 2019
spine-2           swp10(exit-2)             default         655435     655538     10/5/0      Thu
Feb  7 18:19:50 2019
spine-2           swp10.3(exit-2)           DataVrf1081     655435     655538     10/5/0
Thu Feb  7 18:19:50 2019
spine-2           swp10.4(exit-2)           DataVrf1082     655435     655538     10/5/0
Thu Feb  7 18:19:50 2019
spine-2           swp3.2(leaf-11)           DataVrf1080     655435     655559     14/2/0
Thu Feb  7 18:19:50 2019


...
```

**Example: View BGP Configuration Information for a Given Device**

This example shows the BGP configuration information for the spine02 switch. The switch is peered with swp1 on leaf01, swp2 on leaf02, and so on. Spine02 has an ASN of 65020 and each of the leafs have unique ASNs.

```
cumulus@switch:~$ netq spine02 show bgp
Matching bgp records:
Hostname          Neighbor                     VRF             ASN        Peer ASN   PfxRx        Last
Changed
----------------- ---------------------------- --------------- ---------- ---------- ------------
-------------------------
spine02           swp3(spine01)                default         655557     655435     42/27/324
Thu Feb  7 18:19:50 2019
spine02           swp3.2(spine01)              DataVrf1080     655557     655435
31/18/0      Thu Feb  7 18:19:50 2019
spine02           swp3.3(spine01)              DataVrf1081     655557     655435
31/18/0      Thu Feb  7 18:19:50 2019
spine02           swp3.4(spine01)              DataVrf1082     655557     655435
29/18/0      Thu Feb  7 18:19:50 2019
spine02           swp5(spine03)                default         655557     655435     42/27/324
Thu Feb  7 18:19:50 2019
spine02           swp5.2(spine03)              DataVrf1080     655557     655435
31/18/0      Thu Feb  7 18:19:50 2019
spine02           swp5.3(spine03)              DataVrf1081     655557     655435
31/18/0      Thu Feb  7 18:19:50 2019
spine02           swp5.4(spine03)              DataVrf1082     655557     655435
29/18/0      Thu Feb  7 18:19:50 2019
```

### Example: View BGP Configuration Information for a Given ASN

This example shows the BGP configuration information for ASN of *655557*. This ASN is associated with spine02 and so the results show the BGP neighbors for that switch.

```
cumulus@switch:~$ netq show bgp asn 655557
Matching bgp records:
Hostname        Neighbor                 VRF          ASN        Peer ASN   PfxRx        Last
Changed
----------------- --------------------------- --------------- ---------- ---------- ------------
-------------------------
spine02         swp3(spine01)            default        655557     655435     42/27/324
Thu Feb  7 18:19:50 2019
spine02         swp3.2(spine01)          DataVrf1080    655557     655435
31/18/0      Thu Feb  7 18:19:50 2019
spine02         swp3.3(spine01)          DataVrf1081    655557     655435
31/18/0      Thu Feb  7 18:19:50 2019
spine02         swp3.4(spine01)          DataVrf1082    655557     655435
29/18/0      Thu Feb  7 18:19:50 2019
spine02         swp5(spine03)            default        655557     655435     42/27/324
Thu Feb  7 18:19:50 2019
spine02         swp5.2(spine03)          DataVrf1080    655557     655435
31/18/0      Thu Feb  7 18:19:50 2019
spine02         swp5.3(spine03)          DataVrf1081    655557     655435
31/18/0      Thu Feb  7 18:19:50 2019
spine02         swp5.4(spine03)          DataVrf1082    655557     655435
29/18/0      Thu Feb  7 18:19:50 2019
```

### Example: View BGP Configuration Information for a Prior Time

This example shows the BGP configuration information as it was 12 hours earlier.

```
cumulus@switch:~$ netq show bgp around 12h
Matching bgp records:
Hostname          Neighbor                     VRF             ASN        Peer ASN   PfxRx        Last
Changed
----------------- ---------------------------- --------------- ---------- ---------- ------------
-------------------------
exit01            swp3(spine01)                default         655537     655435     29/25/434
Thu Feb  7 18:19:50 2019
exit01            swp3.2(spine01)              DataVrf1080     655537     655435     15/13/0
Thu Feb  7 18:19:50 2019
exit01            swp3.3(spine01)              DataVrf1081     655537     655435     14/13/0
Thu Feb  7 18:19:50 2019
exit01            swp3.4(spine01)              DataVrf1082     655537     655435     16/13/0
Thu Feb  7 18:19:50 2019
exit01            swp4(spine02)                default         655537     655435     29/25/434
Thu Feb  7 18:19:50 2019
exit01            swp4.2(spine02)              DataVrf1080     655537     655435     16/13/0
Thu Feb  7 18:19:50 2019
exit01            swp4.3(spine02)              DataVrf1081     655537     655435     14/13/0
Thu Feb  7 18:19:50 2019
exit01            swp4.4(spine02)              DataVrf1082     655537     655435     16/13/0
Thu Feb  7 18:19:50 2019
exit01            swp5(spine03)                default         655537     655435     30/25/434
Thu Feb  7 18:19:50 2019
exit01            swp5.2(spine03)              DataVrf1080     655537     655435     15/13/0
```

```
Thu Feb  7 18:19:50 2019
exit01           swp5.3(spine03)          DataVrf1081     655537     655435     14/13/0
Thu Feb  7 18:19:50 2019
exit01           swp5.4(spine03)          DataVrf1082     655537     655435     16/13/0
Thu Feb  7 18:19:50 2019
exit01           swp6(firewall01)         default         655537     655539     73/69/-
Thu Feb  7 18:26:30 2019
exit01           swp6.2(firewall01)       DataVrf1080     655537     655539     73/69/-
Thu Feb  7 18:26:30 2019
exit01           swp6.3(firewall01)       DataVrf1081     655537     655539     73/69/-
Thu Feb  7 18:26:30 2019
exit01           swp6.4(firewall01)       DataVrf1082     655537     655539     73/69/-
Thu Feb  7 18:26:30 2019
exit01           swp7                     default         655537     -          NotEstd     Thu Feb  7
18:31:44 2019
exit01           swp7.2                   DataVrf1080     655537     -          NotEstd     Thu
Feb  7 18:31:44 2019
exit01           swp7.3                   DataVrf1081     655537     -          NotEstd     Thu
Feb  7 18:31:44 2019
exit01           swp7.4                   DataVrf1082     655537     -          NotEstd     Thu
Feb  7 18:31:44 2019
exit02           swp3(spine01)            default         655538     655435     28/24/434
Thu Feb  7 18:19:50 2019
exit02           swp3.2(spine01)          DataVrf1080     655538     655435     14/12/0
Thu Feb  7 18:19:50 2019
exit02           swp3.3(spine01)          DataVrf1081     655538     655435     15/12/0
Thu Feb  7 18:19:50 2019
exit02           swp3.4(spine01)          DataVrf1082     655538     655435     15/12/0
Thu Feb  7 18:19:50 2019
```

```
exit02          swp4(spine02)           default       655538    655435    28/24/434
Thu Feb  7 18:19:50 2019
exit02          swp4.2(spine02)          DataVrf1080    655538    655435    14/12/0
Thu Feb  7 18:19:50 2019
exit02          swp4.3(spine02)          DataVrf1081    655538    655435    15/12/0
Thu Feb  7 18:19:50 2019
exit02          swp4.4(spine02)          DataVrf1082    655538    655435    15/12/0
Thu Feb  7 18:19:50 2019
exit02          swp5(spine03)           default       655538    655435    27/24/434
Thu Feb  7 18:19:50 2019
exit02          swp5.2(spine03)          DataVrf1080    655538    655435    15/12/0
Thu Feb  7 18:19:50 2019
exit02          swp5.3(spine03)          DataVrf1081    655538    655435    15/12/0
Thu Feb  7 18:19:50 2019
exit02          swp5.4(spine03)          DataVrf1082    655538    655435    15/12/0
Thu Feb  7 18:19:50 2019
exit02          swp6(firewall01)         default       655538    655539    7/5/-      Thu
Feb  7 18:26:30 2019
exit02          swp6.2(firewall01)        DataVrf1080    655538    655539    7/5/-
Thu Feb  7 18:26:30 2019
exit02          swp6.3(firewall01)        DataVrf1081    655538    655539    7/5/-
Thu Feb  7 18:26:30 2019
exit02          swp6.4(firewall01)        DataVrf1082    655538    655539    7/5/-
Thu Feb  7 18:26:30 2019
exit02          swp7                  default       655538    -       NotEstd     Thu Feb  7
18:31:49 2019
exit02          swp7.2                 DataVrf1080    655538    -       NotEstd     Thu
Feb  7 18:31:49 2019
exit02          swp7.3                 DataVrf1081    655538    -       NotEstd     Thu
```

```
Feb  7 18:31:49 2019
exit02          swp7.4                 DataVrf1082    655538    -        NotEstd     Thu
Feb  7 18:31:49 2019
firewall01      swp3(exit01)           default        655539    655537    29/27/-
Thu Feb  7 18:26:30 2019
firewall01      swp3.2(exit01)         default        655539    655537    15/15/-
Thu Feb  7 18:26:30 2019
firewall01      swp3.3(exit01)         default        655539    655537    15/15/-
Thu Feb  7 18:26:30 2019
firewall01      swp3.4(exit01)         default        655539    655537    15/15/-
Thu Feb  7 18:26:30 2019
firewall01      swp4(exit02)           default        655539    655538    29/27/-
Thu Feb  7 18:26:30 2019
firewall01      swp4.2(exit02)         default        655539    655538    15/15/-
Thu Feb  7 18:26:30 2019
firewall01      swp4.3(exit02)         default        655539    655538    15/15/-
Thu Feb  7 18:26:30 2019
firewall01      swp4.4(exit02)         default        655539    655538    15/15/-
Thu Feb  7 18:26:30 2019
spine01         swp10(exit02)          default        655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine01         swp10.2(exit02)        DataVrf1080    655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine01         swp10.3(exit02)        DataVrf1081    655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine01         swp10.4(exit02)        DataVrf1082    655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine01         swp7(leaf01)           default        655435    655557    17/5/54
Thu Feb  7 18:19:50 2019
```

```
spine01          swp7.2(leaf01)           DataVrf1080    655435    655557    14/2/0
Thu Feb  7 18:19:50 2019
spine01          swp7.3(leaf01)           DataVrf1081    655435    655557    14/2/0
Thu Feb  7 18:19:50 2019
spine01          swp7.4(leaf01)           DataVrf1082    655435    655557    14/2/0
Thu Feb  7 18:19:50 2019
spine01          swp8(leaf02)             default        655435    655558    17/5/54
Thu Feb  7 18:19:50 2019
spine01          swp8.2(leaf02)           DataVrf1080    655435    655558    14/2/0
Thu Feb  7 18:19:50 2019
spine01          swp8.3(leaf02)           DataVrf1081    655435    655558    14/2/0
Thu Feb  7 18:19:50 2019
spine01          swp8.4(leaf02)           DataVrf1082    655435    655558    14/2/0
Thu Feb  7 18:19:50 2019
spine01          swp9(exit01)             default        655435    655537    19/5/0     Thu
Feb  7 18:19:50 2019
spine01          swp9.2(exit01)           DataVrf1080    655435    655537    19/5/0
Thu Feb  7 18:19:50 2019
spine01          swp9.3(exit01)           DataVrf1081    655435    655537    19/5/0
Thu Feb  7 18:19:50 2019
spine01          swp9.4(exit01)           DataVrf1082    655435    655537    19/5/0
Thu Feb  7 18:19:50 2019
spine02          swp10(exit02)            default        655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine02          swp10.3(exit02)          DataVrf1081    655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine02          swp10.4(exit02)          DataVrf1082    655435    655538    10/5/0
Thu Feb  7 18:19:50 2019
spine02          swp7(leaf01)             default        655435    655557    17/5/62
```

```
Thu Feb  7 18:19:50 2019
spine02          swp7.2(leaf01)           DataVrf1080     655435     655557     14/2/0
Thu Feb  7 18:19:50 2019
spine02          swp7.3(leaf01)           DataVrf1081     655435     655557     14/2/0
Thu Feb  7 18:19:50 2019
spine02          swp7.4(leaf01)           DataVrf1082     655435     655557     14/2/0
Thu Feb  7 18:19:50 2019
spine02          swp8(leaf02)             default       655435     655558     17/5/62
Thu Feb  7 18:19:50 2019
spine02          swp8.2(leaf02)           DataVrf1080     655435     655558     14/2/0
Thu Feb  7 18:19:50 2019
spine02          swp8.3(leaf02)           DataVrf1081     655435     655558     14/2/0
Thu Feb  7 18:19:50 2019
spine02          swp8.4(leaf02)           DataVrf1082     655435     655558     14/2/0
Thu Feb  7 18:19:50 2019
spine02          swp9(exit01)             default       655435     655537     19/5/0      Thu
Feb  7 18:19:50 2019
spine02          swp9.2(exit01)           DataVrf1080     655435     655537     19/5/0
Thu Feb  7 18:19:50 2019
spine02          swp9.4(exit01)           DataVrf1082     655435     655537     19/5/0
Thu Feb  7 18:19:50 2019
spine02          swp10.2(exit02)           DataVrf1080     655435     655538     10/5/0
Thu Feb  7 18:19:50 2019
spine02          swp9.3(exit01)           DataVrf1081     655435     655537     19/5/0
Thu Feb  7 18:19:50 2019
leaf01          swp3(spine01)            default       655557     655435     42/27/324
Thu Feb  7 18:19:50 2019
leaf01          swp3.2(spine01)           DataVrf1080     655557     655435     31/18/0
Thu Feb  7 18:19:50 2019
```

```
leaf01          swp3.3(spine01)         DataVrf1081    655557    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf01          swp3.4(spine01)         DataVrf1082    655557    655435    29/18/0
Thu Feb  7 18:19:50 2019
leaf01          swp4(spine02)          default       655557    655435    42/27/324
Thu Feb  7 18:19:50 2019
leaf01          swp4.2(spine02)         DataVrf1080    655557    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf01          swp4.3(spine02)         DataVrf1081    655557    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf01          swp4.4(spine02)         DataVrf1082    655557    655435    29/18/0
Thu Feb  7 18:19:50 2019
leaf01          swp5(spine03)          default       655557    655435    42/27/324
Thu Feb  7 18:19:50 2019
leaf01          swp5.2(spine03)         DataVrf1080    655557    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf01          swp5.3(spine03)         DataVrf1081    655557    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf01          swp5.4(spine03)         DataVrf1082    655557    655435    29/18/0
Thu Feb  7 18:19:50 2019
leaf02          swp3(spine01)          default       655558    655435    42/27/372
Thu Feb  7 18:19:50 2019
leaf02          swp3.2(spine01)         DataVrf1080    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf02          swp3.3(spine01)         DataVrf1081    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf02          swp3.4(spine01)         DataVrf1082    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf02          swp4(spine02)          default       655558    655435    42/27/372
```

```
Thu Feb  7 18:19:50 2019
leaf02           swp4.2(spine02)          DataVrf1080    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf02           swp4.3(spine02)          DataVrf1081    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf02           swp4.4(spine02)          DataVrf1082    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf02           swp5(spine03)           default       655558    655435    42/27/372
Thu Feb  7 18:19:50 2019
leaf02           swp5.2(spine03)          DataVrf1080    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf02           swp5.3(spine03)          DataVrf1081    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
leaf02           swp5.4(spine03)          DataVrf1082    655558    655435    31/18/0
Thu Feb  7 18:19:50 2019
...
```

**Example: View BGP Configuration Changes**

This example shows that BGP configuration changes were made about five days ago on this network.

```
cumulus@switch:~$ netq show events type bgp between now and 5d

Matching bgp records:
Hostname         Message Type Severity Message                          Timestamp
----------------- ------------ -------- ---------------------------------- -------------------------
leaf01           bgp          info     BGP session with peer spine01 @desc 2h:10m:11s
```

```
                          : state changed from failed to esta
                          blished
leaf01       bgp          info    BGP session with peer spine02 @desc 2h:10m:11s
                          : state changed from failed to esta
                          blished
leaf01       bgp          info    BGP session with peer spine03 @desc 2h:10m:11s
                          : state changed from failed to esta
                          blished
leaf01       bgp          info    BGP session with peer spine01 @desc 2h:10m:11s
                          : state changed from failed to esta
                          blished
leaf01       bgp          info    BGP session with peer spine03 @desc 2h:10m:11s
                          : state changed from failed to esta
                          blished
leaf01       bgp          info    BGP session with peer spine02 @desc 2h:10m:11s
                          : state changed from failed to esta
                          blished
leaf01       bgp          info    BGP session with peer spine03 @desc 2h:10m:11s
                          : state changed from failed to esta
                          blished
leaf01       bgp          info    BGP session with peer spine02 @desc 2h:10m:11s
                          : state changed from failed to esta
                          blished
leaf01       bgp          info    BGP session with peer spine01 @desc 2h:10m:11s
                          : state changed from failed to esta
                          blished

...
```

### Validate BGP Operation

A single command enables you to validate that all configured route peering is established across the network. The command checks for duplicate router IDs and sessions that are in an unestablished state. Either of these conditions trigger a configuration check failure. When a failure is found, the reason is identified in the output along with the time the issue occurred.

This example shows a check on the BGP operations that found no failed sessions.

```
cumulus@switch:~$ netq check bgp
Total Nodes: 15, Failed Nodes: 0, Total Sessions: 16, Failed Sessions: 0
```

This example shows 24 failed BGP sessions with a variety of reasons.

```
cumulus@switch:~$ netq check bgp
Total Nodes: 25, Failed Nodes: 3, Total Sessions: 220 , Failed Sessions: 24,
Hostname         VRF             Peer Name         Peer Hostname
Reason                                    Last Changed
----------------- --------------- ----------------- ----------------- ---------------------------------------------
-------------------------
exit-1            DataVrf1080     swp6.2            firewall-1        BGP session with peer
firewall-1 swp6.2: AFI/ 1d:7h:56m:9s
                                                        SAFI evpn not activated on peer
exit-1            DataVrf1080     swp7.2            firewall-2        BGP session with peer
firewall-2 (swp7.2 vrf  1d:7h:49m:31s
                                                        DataVrf1080) failed,
                                                        reason: Peer not configured
```

```
exit-1        DataVrf1081   swp6.3       firewall-1     BGP session with peer
firewall-1 swp6.3: AFI/ 1d:7h:56m:9s
                                             SAFI evpn not activated on peer
exit-1        DataVrf1081   swp7.3       firewall-2     BGP session with peer
firewall-2 (swp7.3 vrf  1d:7h:49m:31s
                                             DataVrf1081) failed,
                                             reason: Peer not configured
exit-1        DataVrf1082   swp6.4       firewall-1     BGP session with peer
firewall-1 swp6.4: AFI/ 1d:7h:56m:9s
                                             SAFI evpn not activated on peer
exit-1        DataVrf1082   swp7.4       firewall-2     BGP session with peer
firewall-2 (swp7.4 vrf  1d:7h:49m:31s
                                             DataVrf1082) failed,
                                             reason: Peer not configured
exit-1        default       swp6         firewall-1     BGP session with peer
firewall-1 swp6: AFI/SA 1d:7h:56m:9s
                                             FI evpn not activated on peer
exit-1        default       swp7         firewall-2     BGP session with peer
firewall-2 (swp7 vrf de 1d:7h:49m:31s
                                             fault) failed, reason: Peer not configured
exit-2        DataVrf1080   swp6.2       firewall-1     BGP session with peer
firewall-1 swp6.2: AFI/ 1d:7h:56m:9s
                                             SAFI evpn not activated on peer
exit-2        DataVrf1080   swp7.2       firewall-2     BGP session with peer
firewall-2 (swp7.2 vrf  1d:7h:49m:26s
                                             DataVrf1080) failed,
                                             reason: Peer not configured
exit-2        DataVrf1081   swp6.3       firewall-1     BGP session with peer
firewall-1 swp6.3: AFI/ 1d:7h:56m:9s
```

```
                                    SAFI evpn not activated on peer
...
```

## Monitor OSPF Configuration

If you have OSPF running on your switches and hosts, you can monitor its operation using the NetQ CLI. For each device, you can view its associated interfaces, areas, peers, state, and type of OSPF running (numbered or unnumbered). Additionally, you can:

- view the information at an earlier point in time
- filter against a particular device, interface, or area
- validate it is operating correctly across the network

The `netq show ospf`command is used to obtain the OSPF configuration information from the devices. The `netq check ospf` command is used to validate the configuration. The syntax of these commands is:

```
netq [<hostname>] show ospf [<remote-interface>] [area <area-id>] [around <text-time>] [json]
netq [<hostname>] show events [level info|level error|level warning|level critical|level debug] type ospf [between <text-time> and <text-endtime>] [json]
netq check ospf [around <text-time>] [json]
```

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the `<text-time>` is the most recent time and the `<text-endtime>` is the oldest time. The values do not have to have the same unit of measure.

### View OSPF Configuration Information

NetQ enables you to view the OSPF configuration of a single device or across all of your devices at once. You can filter the results based on a device, interface, or area. You can view the configuration in the past and view changes made to the configuration within a given timeframe.

**Example: View OSPF Configuration Information Across the Network**

This example shows all devices included in OSPF unnumbered routing, the assigned areas, state, peer and interface, and the last time this information was changed.

```
cumulus@switch:~$ netq show ospf
```

```
Matching ospf records:
Hostname        Interface              Area      Type          State     Peer Hostname
Peer Interface          Last Changed
---------------- ------------------------ ------------ --------------- ---------- -----------------
------------------------ ------------------------
leaf01          swp51                0.0.0.0     Unnumbered      Full      spine01
swp1               Thu Feb  7 14:42:16 2019
leaf01          swp52                0.0.0.0     Unnumbered      Full      spine02
swp1               Thu Feb  7 14:42:16 2019
leaf02          swp51                0.0.0.0     Unnumbered      Full      spine01
swp2               Thu Feb  7 14:42:16 2019
leaf02          swp52                0.0.0.0     Unnumbered      Full      spine02
swp2               Thu Feb  7 14:42:16 2019
leaf03          swp51                0.0.0.0     Unnumbered      Full      spine01
swp3               Thu Feb  7 14:42:16 2019
leaf03          swp52                0.0.0.0     Unnumbered      Full      spine02
swp3               Thu Feb  7 14:42:16 2019
leaf04          swp51                0.0.0.0     Unnumbered      Full      spine01
swp4               Thu Feb  7 14:42:16 2019
leaf04          swp52                0.0.0.0     Unnumbered      Full      spine02
swp4               Thu Feb  7 14:42:16 2019
spine01         swp1                 0.0.0.0     Unnumbered      Full      leaf01
swp51              Thu Feb  7 14:42:16 2019
spine01         swp2                 0.0.0.0     Unnumbered      Full      leaf02
swp51              Thu Feb  7 14:42:16 2019
spine01         swp3                 0.0.0.0     Unnumbered      Full      leaf03
swp51              Thu Feb  7 14:42:16 2019
spine01         swp4                 0.0.0.0     Unnumbered      Full      leaf04
swp51              Thu Feb  7 14:42:16 2019
```

```
spine02       swp1              0.0.0.0     Unnumbered      Full      leaf01
swp52             Thu Feb  7 14:42:16 2019
spine02       swp2              0.0.0.0     Unnumbered      Full      leaf02
swp52             Thu Feb  7 14:42:16 2019
spine02       swp3              0.0.0.0     Unnumbered      Full      leaf03
swp52             Thu Feb  7 14:42:16 2019
spine02       swp4              0.0.0.0     Unnumbered      Full      leaf04
swp52             Thu Feb  7 14:42:16 2019
```

**Example: View OSPF Configuration Information for a Given Device**

This example show the OSPF configuration information for *leaf01*.

```
cumulus@switch:~$ netq leaf01 show ospf

Matching ospf records:
Hostname        Interface            Area       Type          State      Peer Hostname
Peer Interface          Last Changed
---------------- ------------------------ ------------ --------------- ---------- -----------------
------------------------ -------------------------
leaf01         swp51              0.0.0.0     Unnumbered      Full      spine01
swp1              Thu Feb  7 14:42:16 2019
leaf01         swp52              0.0.0.0     Unnumbered      Full      spine02
swp1              Thu Feb  7 14:42:16 2019
```

**Example: View OSPF Configuration Information for a Given Interface**

This example shows the OSPF configuration for all devices with the *swp51* interface.

```
cumulus@switch:~$ netq show ospf swp51

Matching ospf records:
Hostname          Interface                 Area         Type             State      Peer Hostname
Peer Interface            Last Changed
----------------- ------------------------- ------------ ---------------- ---------- -----------------
------------------------- -------------------------
leaf01            swp51                     0.0.0.0      Unnumbered       Full       spine01
swp1                      Thu Feb  7 14:42:16 2019
leaf02            swp51                     0.0.0.0      Unnumbered       Full       spine01
swp2                      Thu Feb  7 14:42:16 2019
leaf03            swp51                     0.0.0.0      Unnumbered       Full       spine01
swp3                      Thu Feb  7 14:42:16 2019
leaf04            swp51                     0.0.0.0      Unnumbered       Full       spine01
swp4                      Thu Feb  7 14:42:16 2019
```

**Example: View OSPF Configuration Information at a Prior Time**

This example shows the OSPF configuration for all leaf switches about five minutes ago.

```
cumulus@switch:~$ netq leaf* show ospf around 5m

Matching ospf records:
Hostname          Interface                 Area         Type             State      Peer Hostname
Peer Interface            Last Changed
----------------- ------------------------- ------------ ---------------- ---------- -----------------
------------------------- -------------------------
leaf01            swp51                     0.0.0.0      Unnumbered       Full       spine01
```

```
swp1           Thu Feb  7 14:42:16 2019
leaf01    swp52          0.0.0.0    Unnumbered    Full    spine02
swp1           Thu Feb  7 14:42:16 2019
leaf02    swp51          0.0.0.0    Unnumbered    Full    spine01
swp2           Thu Feb  7 14:42:16 2019
leaf02    swp52          0.0.0.0    Unnumbered    Full    spine02
swp2           Thu Feb  7 14:42:16 2019
leaf03    swp51          0.0.0.0    Unnumbered    Full    spine01
swp3           Thu Feb  7 14:42:16 2019
leaf03    swp52          0.0.0.0    Unnumbered    Full    spine02
swp3           Thu Feb  7 14:42:16 2019
leaf04    swp51          0.0.0.0    Unnumbered    Full    spine01
swp4           Thu Feb  7 14:42:16 2019
leaf04    swp52          0.0.0.0    Unnumbered    Full    spine02
swp4           Thu Feb  7 14:42:16 2019
```

### Validate OSPF Operation

A single command, `netq check ospf`, enables you to validate that all configured route peering is established across the network. The command checks for:

- router ID conflicts, such as duplicate IDs
- links that are down, or have mismatched MTUs
- mismatched session parameters (hello timer, dead timer, area ids, and network type)

When peer information is not available, the command verifies whether OSPF is configured on the peer and if so, whether the service is disabled, shutdown, or not functioning.

All of these conditions trigger a configuration check failure. When a failure is found, the reason is identified in the output along with the time the issue occurred.

This example shows a check on the OSPF operations that found no failed sessions.

```
cumulus@switch:~$ netq check ospf
Total Sessions: 16, Failed Sessions: 0
```

This example shows a check on the OSPF operations that found two failed sessions. The results indicate the reason for the failure is a mismatched MTU for two links.

```
cumulus@switch:~$ netq check ospf
Total Nodes: 21, Failed Nodes: 2, Total Sessions: 40 , Failed Sessions: 2,
Hostname        Interface            PeerID              Peer IP
Reason                              Last Changed
---------------- ------------------------ ------------------------ ------------------------
----------------------------------------- ------------------------
spine03         swp6                 0.0.0.23            27.0.0.23            mtu mismatch,
mtu mismatch              Thu Feb  7 14:42:16 2019
leaf22          swp5                 0.0.0.17            27.0.0.17            mtu mismatch,
mtu mismatch              Thu Feb  7 14:42:16 2019
```

## View Paths between Devices

You can view the available paths between two devices on the network currently and at a time in the past using their IPv4 or IPv6 addresses. You can view the output in one of three formats (*json*, *pretty*, and *detail*). JSON output provides the output in a JSON file format for ease of importing to other applications or software. Pretty output lines up the paths in a pseudo-graphical manner to help visualize multiple paths. Detail output is the default when not specified, and is useful for traces with higher hop counts where the pretty output wraps lines, making it harder to interpret the results. The detail output displays a table with a row per hop and a set of rows per path.

To view the paths, first identify the addresses for the source and destination devices using the `netq show ip addresses` command (see syntax above), and then use the `netq trace` command to see the available paths between those devices. The trace command syntax is:

```
netq trace <ip> from (<src-hostname>|<ip-src>) [vrf <vrf>] [around <text-time>]
[json|detail|pretty] [debug]
```

> NOTE
>
> The syntax requires the destination device address first, *<ip>*, and then the source device address or hostname.
>
> The tracing function only knows about addresses that have already been learned. If you find that a path is invalid or incomplete, you may need to ping the identified device so that its address becomes known.

### View Paths between Two Switches with Pretty Output

This example first determines the IP addresses of the leaf01 and leaf03 switches, then shows the available paths between them. The results include a summary of the trace, including the total number of paths available, those with errors and warnings, and the MTU of the paths. In this case, the results are displayed in pseudo-graphical output.

```
cumulus@switch:~$ netq leaf01 show ip addresses
Matching address records:
Address                   Hostname          Interface                 VRF             Last Changed
------------------------- ----------------- ------------------------- --------------- -------------------------
10.0.0.11/32              leaf01            lo                        default         Fri Feb  8 01:35:49
2019
10.0.0.11/32              leaf01            swp51                     default         Fri Feb  8 01:35:49
2019
10.0.0.11/32              leaf01            swp52                     default         Fri Feb  8 01:35:49
2019
172.16.1.1/24             leaf01            br0                       default         Fri Feb  8 01:35:49
2019
192.168.0.11/24           leaf01            eth0                      default         Fri Feb  8 01:35:49
2019

cumulus@switch:~$ netq leaf03 show ip addresses
Matching address records:
Address                   Hostname          Interface                 VRF             Last Changed
------------------------- ----------------- ------------------------- --------------- -------------------------
10.0.0.13/32              leaf03            lo                        default         Thu Feb  7 18:31:29
2019
10.0.0.13/32              leaf03            swp51                     default         Thu Feb  7 18:31:29
2019
10.0.0.13/32              leaf03            swp52                     default         Thu Feb  7 18:31:29
2019
172.16.3.1/24             leaf03            br0                       default         Thu Feb  7 18:31:29
```

```
2019
192.168.0.13/24          leaf03          eth0                  default        Thu Feb  7
18:31:29 2019

cumulus@switch:~$ netq trace 10.0.0.13 from 10.0.0.11 pretty
Number of Paths: 2
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 1500

 leaf01 swp52 -- swp1 spine02 swp3 -- swp52 leaf03 <lo>
        swp51 -- swp1 spine01 swp3 -- swp51 leaf03 <lo>
```

### View Paths between Two Switches with Detailed Output

This example provides the same path information as the pretty output, but displays the information in a tabular output. In this case there, no VLAN is configured, so the related fields are left blank.

```
cumulus@switch:~$ netq trace 10.0.0.13 from 10.0.0.11 detail
Number of Paths: 2
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 1500

Id  Hop Hostname        InPort          InVlan InTunnel              InRtrIf         InVRF
OutRtrIf        OutVRF          OutTunnel            OutPort         OutVlan
--- --- --------------- --------------- ------ --------------------- --------------- --------------- ---------------
--------------- --------------------- --------------- -------
```

```
1   1   leaf01                                                              swp52       default
                    swp52
    2   spine02       swp1                             swp1        default       swp3
default                         swp3
    3   leaf03        swp52                            swp52        default       lo
--- --- --------------- --------------- ------ --------------------- --------------- --------------- ---------------
--------------- --------------------- --------------- -------
2   1   leaf01                                                              swp51       default
                    swp51
    2   spine01       swp1                             swp1        default       swp3
default                         swp3
    3   leaf03        swp51                            swp51        default       lo
--- --- --------------- --------------- ------ --------------------- --------------- --------------- ---------------
--------------- --------------------- --------------- -------
```

# Monitor Virtual Network Overlays

With NetQ, a network administrator can monitor virtual network components in the data center, including VXLAN, EVPN, and LNV software constructs. NetQ provides the ability to:

- Manage virtual constructs: view the performance and status of VXLANs, EVPN, and LNV
- Validate overlay communication paths

It helps answer questions such as:

- Is my overlay configured and operating correctly?
- Is my control plane configured correctly?
- Can device A reach device B?

NOTE

Lightweight network virtualization (LNV) was deprecated in Cumulus Linux 3.7.4 and will be removed in Cumulus Linux 4.0.0. LNV is deprecated in Cumulus NetQ 2.3.1, but supports and returns LNV data. Support will be removed from the Cumulus NetQ 2.4.0 release. For information on the support timeline, read these knowledge base articles:

- Cumulus Linux Release Versioning and Support Policy.
- Cumulus NetQ Release Versioning and Support Policy
- Cumulus NetQ Cloud Release Versioning and Support Policy

# Monitor Virtual Extensible LANs

Virtual Extensible LANs (VXLANs) provide a way to create a virtual network on top of layer 2 and layer 3 technologies. It is intended for organizations, such as data centers, that require larger scale without additional infrastructure and more flexibility than is available with existing infrastructure equipment. With NetQ, you can monitor the current and historical configuration and status of your VXLANs using the following command:

```
netq [<hostname>] show vxlan [vni <text-vni>] [around <text-time>] [json]
netq show interfaces type vxlan [state <remote-interface-state>] [around <text-time>] [json]
netq <hostname> show interfaces type vxlan [state <remote-interface-state>] [around <text-time>] [count] [json]
netq [<hostname>] show events [level info|level error|level warning|level critical|level debug] type vxlan [between <text-time> and <text-endtime>] [json]
```

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the `<text-time>` is the most recent time and the `<text-endtime>` is the oldest time. The values do not have to have the same unit of measure.

### View All VXLANs in Your Network

You can view a list of configured VXLANs for all devices, including the VNI (VXLAN network identifier), protocol, address of associated VTEPs (VXLAN tunnel endpoint), replication list, and the last time it was changed. You can also view VXLAN information for a given device by adding a hostname to the `show` command. You can filter the results by VNI.

This example shows all configured VXLANs across the network. In this network, there are three VNIs (13, 24, and 104001) associated with three VLANs (13, 24, 4001), EVPN is the virtual protocol deployed, and the configuration was last changed around 23 hours ago.

```
cumulus@switch:~$ netq show vxlan
Matching vxlan records:
Hostname         VNI        Protoc VTEP IP          VLAN   Replication List                    Last
Changed
                 ol
---------------- ---------- ------ ---------------- ------ -------------------------------- -------------------------
exit01           104001     EVPN   10.0.0.41        4001                                    Fri Feb  8
01:35:49 2019
exit02           104001     EVPN   10.0.0.42        4001                                    Fri Feb  8
01:35:49 2019
leaf01           13         EVPN   10.0.0.112       13     10.0.0.134(leaf04, leaf03)       Fri
Feb  8 01:35:49 2019
leaf01           24         EVPN   10.0.0.112       24     10.0.0.134(leaf04, leaf03)       Fri
Feb  8 01:35:49 2019
leaf01           104001     EVPN   10.0.0.112       4001                                    Fri Feb  8
01:35:49 2019
leaf02           13         EVPN   10.0.0.112       13     10.0.0.134(leaf04, leaf03)       Fri
Feb  8 01:35:49 2019
leaf02           24         EVPN   10.0.0.112       24     10.0.0.134(leaf04, leaf03)       Fri
Feb  8 01:35:49 2019
leaf02           104001     EVPN   10.0.0.112       4001                                    Fri Feb  8
01:35:49 2019
leaf03           13         EVPN   10.0.0.134       13     10.0.0.112(leaf02, leaf01)       Fri
Feb  8 01:35:49 2019
leaf03           24         EVPN   10.0.0.134       24     10.0.0.112(leaf02, leaf01)       Fri
Feb  8 01:35:49 2019
leaf03           104001     EVPN   10.0.0.134       4001                                    Fri Feb  8
01:35:49 2019
leaf04           13         EVPN   10.0.0.134       13     10.0.0.112(leaf02, leaf01)       Fri
```

```
Feb  8 01:35:49 2019
leaf04           24        EVPN   10.0.0.134      24     10.0.0.112(leaf02, leaf01)        Fri
Feb  8 01:35:49 2019
leaf04           104001     EVPN   10.0.0.134      4001                              Fri Feb  8
01:35:49 2019
```

This example shows the events and configuration changes that have occurred on the VXLANs in your network in the last 24 hours. In this case, the EVPN configuration was added to each of the devices in the last 24 hours.

```
cumulus@switch:~$ netq show events type vxlan between now and 24h
Matching vxlan records:
Hostname         VNI        Protoc VTEP IP         VLAN   Replication List                DB
State   Last Changed
                 ol
---------------- ---------- ------ --------------- ------ -------------------------------- ----------
------------------------
exit02           104001     EVPN   10.0.0.42       4001                              Add       Fri
Feb  8 01:35:49 2019
exit02           104001     EVPN   10.0.0.42       4001                              Add       Fri
Feb  8 01:35:49 2019
exit02           104001     EVPN   10.0.0.42       4001                              Add       Fri
Feb  8 01:35:49 2019
exit02           104001     EVPN   10.0.0.42       4001                              Add       Fri
Feb  8 01:35:49 2019
exit02           104001     EVPN   10.0.0.42       4001                              Add       Fri
Feb  8 01:35:49 2019
exit02           104001     EVPN   10.0.0.42       4001                              Add       Fri
```

```
Feb  8 01:35:49 2019
exit02          104001    EVPN   10.0.0.42       4001                         Add       Fri
Feb  8 01:35:49 2019
exit01          104001    EVPN   10.0.0.41       4001                         Add       Fri
Feb  8 01:35:49 2019
exit01          104001    EVPN   10.0.0.41       4001                         Add       Fri
Feb  8 01:35:49 2019
exit01          104001    EVPN   10.0.0.41       4001                         Add       Fri
Feb  8 01:35:49 2019
exit01          104001    EVPN   10.0.0.41       4001                         Add       Fri
Feb  8 01:35:49 2019
exit01          104001    EVPN   10.0.0.41       4001                         Add       Fri
Feb  8 01:35:49 2019
exit01          104001    EVPN   10.0.0.41       4001                         Add       Fri
Feb  8 01:35:49 2019
exit01          104001    EVPN   10.0.0.41       4001                         Add       Fri
Feb  8 01:35:49 2019
exit01          104001    EVPN   10.0.0.41       4001                         Add       Fri
Feb  8 01:35:49 2019
leaf04          104001    EVPN   10.0.0.134      4001                         Add       Fri
Feb  8 01:35:49 2019
leaf04          104001    EVPN   10.0.0.134      4001                         Add       Fri
Feb  8 01:35:49 2019
leaf04          104001    EVPN   10.0.0.134      4001                         Add       Fri
Feb  8 01:35:49 2019
leaf04          104001    EVPN   10.0.0.134      4001                         Add       Fri
Feb  8 01:35:49 2019
leaf04          104001    EVPN   10.0.0.134      4001                         Add       Fri
Feb  8 01:35:49 2019
```

```
leaf04          104001    EVPN   10.0.0.134      4001                              Add       Fri
Feb  8 01:35:49 2019
leaf04          104001    EVPN   10.0.0.134      4001                              Add       Fri
Feb  8 01:35:49 2019
leaf04          13        EVPN   10.0.0.134      13      10.0.0.112()              Add       Fri
Feb  8 01:35:49 2019
leaf04          13        EVPN   10.0.0.134      13      10.0.0.112()              Add       Fri
Feb  8 01:35:49 2019
leaf04          13        EVPN   10.0.0.134      13      10.0.0.112()              Add       Fri
Feb  8 01:35:49 2019
leaf04          13        EVPN   10.0.0.134      13      10.0.0.112()              Add       Fri
Feb  8 01:35:49 2019
leaf04          13        EVPN   10.0.0.134      13      10.0.0.112()              Add       Fri
Feb  8 01:35:49 2019
leaf04          13        EVPN   10.0.0.134      13      10.0.0.112()              Add       Fri
Feb  8 01:35:49 2019
leaf04          13        EVPN   10.0.0.134      13      10.0.0.112()              Add       Fri
Feb  8 01:35:49 2019
...
```

Consequently, if you looked for the VXLAN configuration and status for last week, you would find either another configuration or no configuration. This example shows that no VXLAN configuration was present.

```
cumulus@switch:~$ netq show vxlan around 7d
No matching vxlan records found
```

You can filter the list of VXLANs to view only those associated with a particular VNI. The VNI option lets you specify single VNI (100), a range of VNIs (10-100), or provide a comma-separated list (10,11,12). This example shows the configured VXLANs for *VNI 24*.

```
cumulus@switch:~$ netq show vxlan vni 24
Matching vxlan records:
Hostname         VNI        Protoc VTEP IP          VLAN   Replication List                    Last
Changed
                 ol
---------------- ---------- ------ --------------- ------ -------------------------------- ------------------------
leaf01           24         EVPN   10.0.0.112       24     10.0.0.134(leaf04, leaf03)         Fri
Feb  8 01:35:49 2019
leaf02           24         EVPN   10.0.0.112       24     10.0.0.134(leaf04, leaf03)         Fri
Feb  8 01:35:49 2019
leaf03           24         EVPN   10.0.0.134       24     10.0.0.112(leaf02, leaf01)         Fri
Feb  8 01:35:49 2019
leaf04           24         EVPN   10.0.0.134       24     10.0.0.112(leaf02, leaf01)         Fri
Feb  8 01:35:49 2019
```

### View the Interfaces Associated with VXLANs

You can view detailed information about the VXLAN interfaces using the `netq show interface` command. You can also view this information for a given device by adding a hostname to the `show` command. This example shows the detailed VXLAN interface information for the *leaf02* switch.

```
cumulus@switch:~$ netq leaf02 show interfaces type vxlan
Matching link records:
```

```
Hostname          Interface                 Type             State      VRF
Details                              Last Changed
----------------- ------------------------- ---------------- ---------- ---------------
---------------------------------- -------------------------
leaf02            vni13                     vxlan            up         default         VNI: 13, PVID: 13,
Master: bridge,  Fri Feb  8 01:35:49 2019
                                                                                        VTEP: 10.0.0.112, MTU: 9000
leaf02            vni24                     vxlan            up         default         VNI: 24, PVID: 24,
Master: bridge,  Fri Feb  8 01:35:49 2019
                                                                                        VTEP: 10.0.0.112, MTU: 9000
leaf02            vxlan4001                 vxlan            up         default         VNI: 104001, PVID:
4001,            Fri Feb  8 01:35:49 2019
                                                                                        Master: bridge, VTEP: 10.0.0.112,
                                                                                        MTU: 1500
```

## Monitor EVPN

EVPN (Ethernet Virtual Private Network) enables network administrators in the data center to deploy a virtual layer 2 bridge overlay on top of layer 3 IP networks creating access, or tunnel, between two locations. This connects devices in different layer 2 domains or sites running VXLANs and their associated underlays. With NetQ, you can monitor the configuration and status of the EVPN setup using the `netq show evpn` command. You can filter the EVPN information by a VNI (VXLAN network identifier), and view the current information or for a time in the past. The command also enables visibility into changes that have occurred in the configuration during a specific timeframe. The syntax for the command is:

```
netq [<hostname>] show evpn [vni <text-vni>] [mac-consistency] [around <text-time>] [json]
netq [<hostname>] show events [level info|level error|level warning|level critical|level debug] type vxlan [between <text-time> and <text-endtime>] [json]
```

> NOTE
>
> When entering a time value, you must include a numeric value *and* the unit of measure:
>
> - d: day(s)
> - h: hour(s)
> - m: minute(s)
> - s: second(s)
> - now
>
> For time ranges, the `<text-time>` is the most recent time and the `<text-endtime>` is the oldest time. The values do not have to have the same unit of measure.

For more information about and configuration of EVPN in your data center, refer to the Cumulus Linux EVPN topic.

### View the Status of EVPN

You can view the configuration and status of your EVPN overlay across your network or for a particular device. This example shows the configuration and status for all devices, including the associated VNI, VTEP address, the import and export route (showing the

BGP ASN and VNI path), and the last time a change was made for each device running EVPN. Use the `hostname` option to view the configuration and status for a single device.

```
cumulus@switch:~$ netq show evpn
Matching evpn records:
Hostname         VNI        VTEP IP          In Kernel Export RT        Import RT        Last
Changed
---------------- ---------- ---------------- --------- ---------------- ---------------- ------------------------
leaf01           33         27.0.0.22        yes       197:33           197:33           Fri Feb  8
01:48:27 2019
leaf01           34         27.0.0.22        yes       197:34           197:34           Fri Feb  8
01:48:27 2019
leaf01           35         27.0.0.22        yes       197:35           197:35           Fri Feb  8
01:48:27 2019
leaf01           36         27.0.0.22        yes       197:36           197:36           Fri Feb  8
01:48:27 2019
leaf01           37         27.0.0.22        yes       197:37           197:37           Fri Feb  8
01:48:27 2019
leaf01           38         27.0.0.22        yes       197:38           197:38           Fri Feb  8
01:48:27 2019
leaf01           39         27.0.0.22        yes       197:39           197:39           Fri Feb  8
01:48:27 2019
leaf01           40         27.0.0.22        yes       197:40           197:40           Fri Feb  8
01:48:27 2019
leaf01           41         27.0.0.22        yes       197:41           197:41           Fri Feb  8
01:48:27 2019
leaf01           42         27.0.0.22        yes       197:42           197:42           Fri Feb  8
01:48:27 2019
leaf02           33         27.0.0.23        yes       198:33           198:33           Thu Feb  7
```

```
18:31:41 2019
leaf02      34     27.0.0.23    yes    198:34     198:34     Thu Feb  7
18:31:41 2019
leaf02      35     27.0.0.23    yes    198:35     198:35     Thu Feb  7
18:31:41 2019
leaf02      36     27.0.0.23    yes    198:36     198:36     Thu Feb  7
18:31:41 2019
leaf02      37     27.0.0.23    yes    198:37     198:37     Thu Feb  7
18:31:41 2019
leaf02      38     27.0.0.23    yes    198:38     198:38     Thu Feb  7
18:31:41 2019
leaf02      39     27.0.0.23    yes    198:39     198:39     Thu Feb  7
18:31:41 2019
leaf02      40     27.0.0.23    yes    198:40     198:40     Thu Feb  7
18:31:41 2019
leaf02      41     27.0.0.23    yes    198:41     198:41     Thu Feb  7
18:31:41 2019
leaf02      42     27.0.0.23    yes    198:42     198:42     Thu Feb  7
18:31:41 2019
...
```

### View the Status of EVPN for a Given VNI

You can filter the full device view to focus on a single VNI. This example only shows the EVPN configuration and status for VNI *42*.

```
cumulus@switch:~$ netq show evpn vni 42
Matching evpn records:
Hostname      VNI     VTEP IP      In Kernel Export RT      Import RT      Last
```

```
Changed
---------------- ---------- --------------- --------- --------------- --------------- ------------------------
leaf01           42         27.0.0.22       yes       197:42          197:42          Thu Feb 14
00:48:24 2019
leaf02           42         27.0.0.23       yes       198:42          198:42          Wed Feb 13
18:14:49 2019
leaf11           42         36.0.0.24       yes       199:42          199:42          Wed Feb 13
18:14:22 2019
leaf12           42         36.0.0.24       yes       200:42          200:42          Wed Feb 13
18:14:27 2019
leaf21           42         36.0.0.26       yes       201:42          201:42          Wed Feb 13
18:14:33 2019
leaf22           42         36.0.0.26       yes       202:42          202:42          Wed Feb 13
18:14:37 2019
```

### View EVPN Events

You can view status and configuration change events for the EVPN protocol service using the `netq show events` command. This example shows the events that have occurred in the last 48 hours.

```
cumulus@switch:/$ netq show events type evpn between now and 48h
Matching events records:
Hostname         Message Type Severity Message                          Timestamp
---------------- ------------ -------- -------------------------------- ------------------------
torc-21          evpn         info     VNI 33 state changed from down to u 1d:8h:16m:29s
                              p
torc-12          evpn         info     VNI 41 state changed from down to u 1d:8h:16m:35s
                              p
```

```
torc-11     evpn     info    VNI 39 state changed from down to u 1d:8h:16m:41s
                             p
tor-1       evpn     info    VNI 37 state changed from down to u 1d:8h:16m:47s
                             p
tor-2       evpn     info    VNI 42 state changed from down to u 1d:8h:16m:51s
                             p
torc-22     evpn     info    VNI 39 state changed from down to u 1d:8h:17m:40s
                             p
...
```

# Monitor LNV

Lightweight Network Virtualization (LNV) is a technique for deploying VXLANs without a central controller on bare metal switches. LNV enables data center network administrators and operators to create a data path between bridges on top of a layer 3 fabric. With NetQ, you can monitor the configuration and status of the LNV setup using the `netq show lnv` command. You can view the current information or for a time in the past. The command also enables visibility into changes that have occurred in the configuration during a specific time frame. The syntax for the command is:

```
netq [<hostname>] show lnv [around <text-time>] [json]
netq [<hostname>] show events [level info|level error|level warning|level critical|
level debug] type lnv [between <text-time> and <text-endtime>] [json]
```

NOTE

Lightweight network virtualization (LNV) was deprecated in Cumulus Linux 3.7.4 and will be removed in Cumulus Linux 4.0.0. LNV is deprecated in Cumulus NetQ 2.3.1, but supports and returns LNV data. Support will be removed from the Cumulus NetQ 2.4.0 release. For information on the support timeline, read these knowledge base articles:

- Cumulus Linux Release Versioning and Support Policy.
- Cumulus NetQ Release Versioning and Support Policy
- Cumulus NetQ Cloud Release Versioning and Support Policy

### View LNV Status

You can view the configuration and status of your LNV overlay across your network or for a particular device. This example shows the configuration and status of LNV across the network, including the role each node plays, replication mode, number of peers and VNIs, and the last time the configuration was changed.

```
cumulus@switch:~$ netq show lnv
Matching LNV session records are:
Hostname         Role       ReplMode State      #Peers #VNIs  Last Changed
---------------- ---------- -------- ---------- ------ ------ -------------------------
spine01          SND        HER      up         3      6      Thu Feb  7 18:31:31 2019
spine02          SND        HER      up         3      6      Thu Feb  7 18:31:31 2019
spine03          SND        HER      up         3      6      Thu Feb  7 18:31:31 2019
leaf01           RD         HER      up         4      6      Thu Feb  7 18:31:31 2019
leaf02           RD         HER      up         4      6      Thu Feb  7 18:31:31 2019
```

```
leaf11          RD       HER      up       0     0     Thu Feb  7 18:31:31 2019
leaf12          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
leaf21          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
leaf22          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
```

### View LNV Status in the Past

You can view the status in the past using the `around` option. This example shows the status of LNV about 30 minutes ago.

```
cumulus@switch:~$ netq show lnv around 30m
Matching LNV session records are:
Hostname         Role       ReplMode State      #Peers #VNIs  Last Changed
---------------- ---------- -------- ---------- ------ ------ ------------------------
spine01          SND        HER      up       3     6     Thu Feb  7 18:31:31 2019
spine02          SND        HER      up       3     6     Thu Feb  7 18:31:31 2019
spine03          SND        HER      up       3     6     Thu Feb  7 18:31:31 2019
leaf01          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
leaf02          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
leaf11          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
leaf12          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
leaf21          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
leaf22          RD       HER      up       4     6     Thu Feb  7 18:31:31 2019
```

For more information about and configuration of LNV, refer to the Cumulus Linux LNV Overview topic.

# Monitor Linux Hosts

Running NetQ on Linux hosts provides unprecedented network visibility, giving the network operator a complete view of the entire infrastructure's network connectivity instead of just from the network devices.

The NetQ Agent is supported on the following Linux hosts:

- CentOS 7
- Red Hat Enterprise Linux 7.1
- Ubuntu 16.04

You need to install the OS-specific NetQ metapack on every host you want to monitor with NetQ.

The NetQ Agent monitors the following on Linux hosts:

- netlink
- Layer 2: LLDP and VLAN-aware bridge
- Layer 3: IPv4, IPv6
- Routing on the Host: BGP, OSPF
- systemctl for services
- Docker containers — refer to the Monitor Container Environments topic

Using NetQ on a Linux host is the same as using it on a Cumulus Linux switch. For example, if you want to check LLDP neighbor information about a given host, run:

```
cumulus@switch:~$ netq server01 show lldp
Matching lldp records:
```

```
Hostname        Interface               Peer Hostname     Peer Interface          Last
Changed
----------------- ------------------------- ----------------- ------------------------- -------------------------
server01        eth0                oob-mgmt-switch   swp2                Fri Feb  8
01:50:59 2019
server01        eth1                leaf01          swp1                Fri Feb  8 01:50:59
2019
server01        eth2                leaf02          swp1                Fri Feb  8 01:50:59
2019
```

Then, to see LLDP from the switch's perspective:

```
cumulus@switch:~$ netq leaf01 show lldp
Matching lldp records:
Hostname        Interface               Peer Hostname     Peer Interface          Last
Changed
----------------- ------------------------- ----------------- ------------------------- -------------------------
leaf01          eth0                oob-mgmt-switch   swp6                Thu Feb  7
18:31:26 2019
leaf01          swp1                server01        eth1                Thu Feb  7 18:31:26
2019
leaf01          swp2                server02        eth1                Thu Feb  7 18:31:26
2019
leaf01          swp49               leaf02          swp49               Thu Feb  7 18:31:26
2019
leaf01          swp50               leaf02          swp50               Thu Feb  7 18:31:26
2019
leaf01          swp51               spine01         swp1                Thu Feb  7 18:31:26
```

```
2019
leaf01          swp52              spine02       swp1              Thu Feb  7 18:31:26
2019
```

To get the routing table for a server:

```
cumulus@server01:~$ netq server01 show ip route
Matching routes records:
Origin VRF          Prefix                    Hostname        Nexthops                      Last
Changed
------ --------------- ----------------------------- ----------------- -----------------------------------
------------------------
no     default        10.2.4.0/24                server01        10.1.3.1: uplink                Fri
Feb  8 01:50:49 2019
no     default        172.16.1.0/24               server01        10.1.3.1: uplink
Fri Feb  8 01:50:49 2019
yes    default        10.1.3.0/24                server01        uplink                        Fri
Feb  8 01:50:49 2019
yes    default        10.1.3.101/32               server01        uplink                        Fri
Feb  8 01:50:49 2019
yes    default        192.168.0.0/24              server01        eth0                          Fri
Feb  8 01:50:49 2019
yes    default        192.168.0.31/32             server01        eth0                          Fri
Feb  8 01:50:49 2019
```

# Monitor Container Environments

The NetQ Agent monitors container environments the same way it monitors physical servers. There is no special implementation. The NetQ Agent pulls data from the container as it would pull data from a Cumulus Linux switch or Linux host. It can be installed on a Linux server or in a Linux VM. NetQ Agent integrates with the Kubernetes container orchestrator.

NetQ monitors many aspects of containers on your network, including their:

- **Identity**: The NetQ agent tracks every container's IP and MAC address, name, image, and more. NetQ can locate containers across the fabric based on a container's name, image, IP or MAC address, and protocol and port pair.
- **Port mapping on a network**: The NetQ agent tracks protocol and ports exposed by a container. NetQ can identify containers exposing a specific protocol and port pair on a network.
- **Connectivity**: NetQ can provide information on network connectivity for a container, including adjacency, and can identify containers that can be affected by a top of rack switch.

NetQ helps answer questions such as:

- Where is this container located?
- Open ports? What image is being used?
- Which containers are part of this service? How are they connected?

# Use NetQ with Kubernetes Clusters

The NetQ Agent interfaces with a Kubernetes API server and listens to Kubernetes events. The NetQ Agent monitors network identity and physical network connectivity of Kubernetes resources like Pods, Daemon sets, Service, and so forth. NetQ works with any container network interface (CNI), such as Calico or Flannel.

The NetQ Kubernetes integration enables network administrators to:

- Identify and locate pods, deployment, replica-set and services deployed within the network using IP, name, label, and so forth.
- Track network connectivity of all pods of a service, deployment and replica set.
- Locate what pods have been deployed adjacent to a top of rack (ToR) switch.
- Check what pod, services, replica set or deployment can be impacted by a specific ToR switch.

NetQ also helps network administrators identify changes within a Kubernetes cluster and determine if such changes had an adverse effect on the network performance (caused by a noisy neighbor for example). Additionally, NetQ helps the infrastructure administrator determine how Kubernetes workloads are distributed within a network.

## Requirements

The NetQ Agent supports Kubernetes version 1.9.2 or later.

Due to the higher memory requirements to run containers, Cumulus Networks recommends you run the NetQ Platform on a host with at least 64G RAM.

## Command Summary

There is a large set of commands available to monitor Kubernetes configurations, including the ability to monitor clusters, nodes, daemon-set, deployment, pods, replication, and services. Run `netq show kubernetes help` to see all the possible commands:

```
netq [<hostname>] show kubernetes cluster [name <kube-cluster-name>] [around <text-time>] [json]
netq [<hostname>] show kubernetes node [components] [name <kube-node-name>] [cluster <kube-cluster-name> ] [label <kube-node-label>] [around <text-time>] [json]
netq [<hostname>] show kubernetes daemon-set [name <kube-ds-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-ds-label>] [around <text-time>] [json]
netq [<hostname>] show kubernetes daemon-set [name <kube-ds-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-ds-label>] connectivity [around <text-time>] [json]
netq [<hostname>] show kubernetes deployment [name <kube-deployment-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-deployment-label>] [around <text-time>] [json]
netq [<hostname>] show kubernetes deployment [name <kube-deployment-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-deployment-label>] connectivity [around <text-time>] [json]
netq [<hostname>] show kubernetes pod [name <kube-pod-name>] [cluster <kube-cluster-name> ] [namespace <namespace>] [label <kube-pod-label>] [pod-ip <kube-pod-ipaddress>] [node <kube-node-name>] [around <text-time>] [json]
netq [<hostname>] show kubernetes replication-controller [name <kube-rc-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-rc-label>] [around <text-time>] [json]
netq [<hostname>] show kubernetes replica-set [name <kube-rs-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-rs-label>] [around <text-time>] [json]
netq [<hostname>] show kubernetes replica-set [name <kube-rs-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-rs-label>] connectivity [around <text-time>] [json]
```

```
netq [<hostname>] show kubernetes service [name <kube-service-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-service-label>] [service-cluster-ip <kube-service-cluster-ip>] [service-external-ip <kube-service-external-ip>] [around <text-time>] [json]
netq [<hostname>] show kubernetes service [name <kube-service-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-service-label>] [service-cluster-ip <kube-service-cluster-ip>] [service-external-ip <kube-service-external-ip>] connectivity [around <text-time>] [json]
netq <hostname> show impact kubernetes service [master <kube-master-node>] [name <kube-service-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-service-label>] [service-cluster-ip <kube-service-cluster-ip>] [service-external-ip <kube-service-external-ip>] [around <text-time>] [json]
netq <hostname> show impact kubernetes replica-set [master <kube-master-node>] [name <kube-rs-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-rs-label>] [around <text-time>] [json]
netq <hostname> show impact kubernetes deployment [master <kube-master-node>] [name <kube-deployment-name>] [cluster <kube-cluster-name>] [namespace <namespace>] [label <kube-deployment-label>] [around <text-time>] [json]
netq config add agent kubernetes-monitor [poll-period <text-duration-period>]
netq config del agent kubernetes-monitor
netq config show agent kubernetes-monitor [json]
```

### Enable Kubernetes Monitoring

For NetQ to monitor the containers on a host, you must configure the following on the Kubernetes master node:

1. Configure the host to point to the NetQ Platform by its IP address. See the Install NetQ topic for details.
2. Enable Kubernetes monitoring by NetQ. You can specify a polling period between 10 and 120 seconds; 15 seconds is the default.

```
cumulus@host:~$ netq config add agent kubernetes-monitor poll-period 20
Successfully added kubernetes monitor. Please restart netq-agent.
```

3. Restart the NetQ agent:

```
cumulus@server01:~$ netq config restart agent
```

Next, you must enable the NetQ Agent on all the worker nodes, as described in the Install NetQ Agents and CLI on Switches, for complete insight into your container network.

### View Status of Kubernetes Clusters

You can get the status of all Kubernetes clusters in the fabric using the `netq show kubernetes cluster` command:

```
cumulus@switch:~$ netq show kubernetes cluster
Matching kube_cluster records:
Master                   Cluster Name     Controller Status    Scheduler Status Nodes
------------------------ ---------------- -------------------- ---------------- --------------------
```

```
server11:3.0.0.68      default      Healthy         Healthy       server11 server13 se
                                                                  rver22 server11 serv
                                                                  er12 server23 server
                                                                  24
server12:3.0.0.69      default      Healthy         Healthy       server12 server21 se
                                                                  rver23 server13 serv
                                                                  er14 server21 server
                                                                  22
```

To filter the list, you can specify the hostname of the master before the `show` command:

```
cumulus@switch:~$ netq server11 show kubernetes cluster
Matching kube_cluster records:
Master                   Cluster Name     Controller Status    Scheduler Status Nodes
------------------------ ---------------- -------------------- ---------------- --------------------
server11:3.0.0.68      default      Healthy         Healthy       server11 server13 se
                                                                  rver22 server11 serv
                                                                  er12 server23 server
                                                                  24
```

Optionally, you can output the results in JSON format:

```
cumulus@server11:~$ netq show kubernetes cluster json
{
    "kube_cluster":[
        {
            "clusterName":"default",
            "schedulerStatus":"Healthy",
            "master":"server12:3.0.0.69",
            "nodes":"server12 server21 server23 server13 server14 server21 server22",
            "controllerStatus":"Healthy"
        },
        {
            "clusterName":"default",
            "schedulerStatus":"Healthy",
            "master":"server11:3.0.0.68",
            "nodes":"server11 server13 server22 server11 server12 server23 server24",
            "controllerStatus":"Healthy"
    }
    ],
    "truncatedResult":false
}
```

### View Changes to a Cluster

If data collection from the NetQ Agents is not occurring as it once was, you can verify that no changes have been made to the Kubernetes cluster configuration using the `around` option. This example shows the changes that have been made in the last hour.

```
cumulus@server11:~$ netq show kubernetes cluster around 1h
Matching kube_cluster records:
Master                   Cluster Name     Controller Status    Scheduler Status
Nodes                            DBState  Last changed
------------------------ ---------------- -------------------- ---------------- -----------------------------------------
-------- ------------------------
server11:3.0.0.68        default          Healthy              Healthy          server11 server13
server22 server11 serv Add      Fri Feb  8 01:50:50 2019
                                                                      er12 server23 server24
server12:3.0.0.69        default          Healthy              Healthy          server12 server21
server23 server13 serv Add      Fri Feb  8 01:50:50 2019
                                                                      er14 server21 server22
server12:3.0.0.69        default          Healthy              Healthy          server12 server21
server23 server13      Add      Fri Feb  8 01:50:50 2019
server11:3.0.0.68        default          Healthy              Healthy
server11                         Add      Fri Feb  8 01:50:50 2019
server12:3.0.0.69        default          Healthy              Healthy
server12                         Add      Fri Feb  8 01:50:50 2019
```

### View Kubernetes Pod Information

You can show configuration and status of the pods in a cluster, including the names, labels, addresses, associated cluster and containers, and whether the pod is running. This example shows pods for FRR, Nginx, Calico, various Kubernetes components sorted by master node.

```
cumulus@server11:~$ netq show kubernetes pod
Matching kube_pod records:
```

```
Master                 Namespace    Name                 IP               Node         Labels
Status   Containers              Last Changed
----------------------- ------------ -------------------- ---------------- ------------ -------------------- --------
----------------------- ----------------
server11:3.0.0.68       default      cumulus-frr-8vssx    3.0.0.70         server13     pod-
template-generat Running  cumulus-frr:f8cac70bb217 Fri Feb  8 01:50:50 2019
                                                                           ion:1 name:cumulus-f
                                                                           rr controller-revisi
                                                                           on-hash:3710533951
server11:3.0.0.68       default      cumulus-frr-dkkgp    3.0.5.135        server24     pod-
template-generat Running  cumulus-frr:577a60d5f40c Fri Feb  8 01:50:50 2019
                                                                           ion:1 name:cumulus-f
                                                                           rr controller-revisi
                                                                           on-hash:3710533951
server11:3.0.0.68       default      cumulus-frr-f4bgx    3.0.3.196        server11     pod-
template-generat Running  cumulus-frr:1bc73154a9f5 Fri Feb  8 01:50:50 2019
                                                                           ion:1 name:cumulus-f
                                                                           rr controller-revisi
                                                                           on-hash:3710533951
server11:3.0.0.68       default      cumulus-frr-gqqxn    3.0.2.5          server22     pod-
template-generat Running  cumulus-frr:3ee0396d126a Fri Feb  8 01:50:50 2019
                                                                           ion:1 name:cumulus-f
                                                                           rr controller-revisi
                                                                           on-hash:3710533951
server11:3.0.0.68       default      cumulus-frr-kdh9f    3.0.3.197        server12     pod-
template-generat Running  cumulus-frr:94b6329ecb50 Fri Feb  8 01:50:50 2019
                                                                           ion:1 name:cumulus-f
                                                                           rr controller-revisi
                                                                           on-hash:3710533951
```

```
server11:3.0.0.68       default      cumulus-frr-mvv8m    3.0.5.134       server23
pod-template-generat Running  cumulus-frr:b5845299ce3c Fri Feb  8 01:50:50
2019
                                                                  ion:1 name:cumulus-f
                                                                  rr controller-revisi
                                                                  on-hash:3710533951
server11:3.0.0.68       default      httpd-5456469bfd-bq9 10.244.49.65     server22
app:httpd           Running  httpd:79b7f532be2d       Fri Feb  8 01:50:50 2019
                                     zm
server11:3.0.0.68       default      influxdb-6cdb566dd-8 10.244.162.128   server13
app:influx          Running  influxdb:15dce703cdec    Fri Feb  8 01:50:50 2019
                                     9lwn
server11:3.0.0.68       default      nginx-8586cf59-26pj5 10.244.9.193     server24
run:nginx           Running  nginx:6e2b65070c86       Fri Feb  8 01:50:50 2019
server11:3.0.0.68       default      nginx-8586cf59-c82ns 10.244.40.128    server12
run:nginx           Running  nginx:01b017c26725       Fri Feb  8 01:50:50 2019
server11:3.0.0.68       default      nginx-8586cf59-wjwgp 10.244.49.64     server22
run:nginx           Running  nginx:ed2b4254e328       Fri Feb  8 01:50:50 2019
server11:3.0.0.68       kube-system  calico-etcd-pfg9r    3.0.0.68        server11     k8s-
app:calico-etcd  Running  calico-etcd:f95f44b745a7 Fri Feb  8 01:50:50 2019
                                                                  pod-template-generat
                                                                  ion:1 controller-rev
                                                                  ision-hash:142071906
                                                                  5
server11:3.0.0.68       kube-system  calico-kube-controll 3.0.2.5         server22
k8s-app:calico-kube- Running  calico-kube-controllers: Fri Feb  8 01:50:50 2019
                                     ers-d669cc78f-4r5t2                       controllers
3688b0c5e9c5
server11:3.0.0.68       kube-system  calico-node-4px69    3.0.2.5         server22
```

```
k8s-app:calico-node  Running  calico-node:1d01648ebba4 Fri Feb  8 01:50:50 2019
                                          pod-template-generat
install-cni:da350802a3d2
                                          ion:1 controller-rev
                                          ision-hash:324404111
                                          9
server11:3.0.0.68       kube-system  calico-node-bt8w6    3.0.3.196       server11
k8s-app:calico-node  Running  calico-node:9b3358a07e5e Fri Feb  8 01:50:50 2019
                                          pod-template-generat
install-cni:d38713e6fdd8
                                          ion:1 controller-rev
                                          ision-hash:324404111
                                          9
server11:3.0.0.68       kube-system  calico-node-gtmkv    3.0.3.197       server12
k8s-app:calico-node  Running  calico-node:48fcc6c40a6b Fri Feb  8 01:50:50 2019
                                          pod-template-generat
install-cni:f0838a313eff
                                          ion:1 controller-rev
                                          ision-hash:324404111
                                          9
server11:3.0.0.68       kube-system  calico-node-mvslq    3.0.5.134       server23
k8s-app:calico-node  Running  calico-node:7b361aece76c Fri Feb  8 01:50:50 2019
                                          pod-template-generat
install-cni:f2da6bc36bf8
                                          ion:1 controller-rev
                                          ision-hash:324404111
                                          9
server11:3.0.0.68       kube-system  calico-node-sjj2s    3.0.5.135       server24
k8s-app:calico-node  Running  calico-node:6e13b2b73031 Fri Feb  8 01:50:50 2019
```

```
                                                            pod-template-generat
install-cni:fa4b2b17fba9
                                                            ion:1 controller-rev
                                                            ision-hash:324404111
                                                            9
server11:3.0.0.68       kube-system  calico-node-vdkk5    3.0.0.70        server13
k8s-app:calico-node  Running  calico-node:fb3ec9429281 Fri Feb  8 01:50:50 2019
                                                            pod-template-generat
install-cni:b56980da7294
                                                            ion:1 controller-rev
                                                            ision-hash:324404111
                                                            9
server11:3.0.0.68       kube-system  calico-node-zzfkr    3.0.0.68        server11     k8s-
app:calico-node  Running  calico-node:c1ac399dd862 Fri Feb  8 01:50:50 2019
                                                            pod-template-generat
install-cni:60a779fdc47a
                                                            ion:1 controller-rev
                                                            ision-hash:324404111
                                                            9
server11:3.0.0.68       kube-system  etcd-server11        3.0.0.68        server11
tier:control-plane c Running  etcd:dde63d44a2f5       Fri Feb  8 01:50:50 2019
                                                            omponent:etcd
server11:3.0.0.68       kube-system  kube-apiserver-hostd 3.0.0.68        server11
tier:control-plane c Running  kube-apiserver:0cd557bbf Fri Feb  8 01:50:50 2019
                        -11                                   omponent:kube-apiser        2fe
                                                            ver
server11:3.0.0.68       kube-system  kube-controller-mana 3.0.0.68        server11
tier:control-plane c Running  kube-controller-manager: Fri Feb  8 01:50:50 2019
                        ger-server11                               omponent:kube-
```

```
contro        89b2323d09b2
                                              ller-manager
server11:3.0.0.68       kube-system  kube-dns-6f4fd4bdf-p 10.244.34.64
server23     k8s-app:kube-dns     Running  dnsmasq:284d9d363999 kub Fri Feb  8
01:50:50 2019
                              lv7p
edns:bd8bdc49b950 sideca
                                                                  r:fe10820ffb19
server11:3.0.0.68       kube-system  kube-proxy-4cx2t     3.0.3.197       server12
k8s-app:kube-proxy p Running  kube-proxy:49b0936a4212  Fri Feb  8 01:50:50 2019
                                              od-template-generati
                                              on:1 controller-revi
                                              sion-hash:3953509896
server11:3.0.0.68       kube-system  kube-proxy-7674k     3.0.3.196       server11
k8s-app:kube-proxy p Running  kube-proxy:5dc2f5fe0fad  Fri Feb  8 01:50:50 2019
                                              od-template-generati
                                              on:1 controller-revi
                                              sion-hash:3953509896
server11:3.0.0.68       kube-system  kube-proxy-ck5cn     3.0.2.5         server22
k8s-app:kube-proxy p Running  kube-proxy:6944f7ff8c18  Fri Feb  8 01:50:50 2019
                                              od-template-generati
                                              on:1 controller-revi
                                              sion-hash:3953509896
server11:3.0.0.68       kube-system  kube-proxy-f9dt8     3.0.0.68        server11
k8s-app:kube-proxy p Running  kube-proxy:032cc82ef3f8  Fri Feb  8 01:50:50 2019
                                              od-template-generati
                                              on:1 controller-revi
                                              sion-hash:3953509896
server11:3.0.0.68       kube-system  kube-proxy-j6qw6     3.0.5.135       server24
```

```
k8s-app:kube-proxy p Running  kube-proxy:10544e43212e  Fri Feb  8 01:50:50 2019
                                                       od-template-generati
                                                       on:1 controller-revi
                                                       sion-hash:3953509896
server11:3.0.0.68       kube-system  kube-proxy-lq8zz     3.0.5.134       server23
k8s-app:kube-proxy p Running  kube-proxy:1bcfa09bb186  Fri Feb  8 01:50:50 2019
                                                       od-template-generati
                                                       on:1 controller-revi
                                                       sion-hash:3953509896
server11:3.0.0.68       kube-system  kube-proxy-vg7kj     3.0.0.70        server13
k8s-app:kube-proxy p Running  kube-proxy:8fed384b68e5  Fri Feb  8 01:50:50 2019
                                                       od-template-generati
                                                       on:1 controller-revi
                                                       sion-hash:3953509896
server11:3.0.0.68       kube-system  kube-scheduler-hostd 3.0.0.68        server11
tier:control-plane c Running  kube-scheduler:c262a8071 Fri Feb  8 01:50:50 2019
                     -11                                omponent:kube-schedu
3cb
                                                       ler
server12:3.0.0.69       default      cumulus-frr-2gkdv    3.0.2.4         server21     pod-
template-generat Running  cumulus-frr:25d1109f8898 Fri Feb  8 01:50:50 2019
                                                       ion:1 name:cumulus-f
                                                       rr controller-revisi
                                                       on-hash:3710533951
server12:3.0.0.69       default      cumulus-frr-b9dm5    3.0.3.199       server14
pod-template-generat Running  cumulus-frr:45063f9a095f Fri Feb  8 01:50:50 2019
                                                       ion:1 name:cumulus-f
                                                       rr controller-revisi
                                                       on-hash:3710533951
```

```
server12:3.0.0.69       default      cumulus-frr-rtqhv    3.0.2.6         server23     pod-
template-generat Running  cumulus-frr:63e802a52ea2 Fri Feb  8 01:50:50 2019
                                                          ion:1 name:cumulus-f
                                                          rr controller-revisi
                                                          on-hash:3710533951
server12:3.0.0.69       default      cumulus-frr-tddrg    3.0.5.133       server22     pod-
template-generat Running  cumulus-frr:52dd54e4ac9f Fri Feb  8 01:50:50 2019
                                                          ion:1 name:cumulus-f
                                                          rr controller-revisi
                                                          on-hash:3710533951
server12:3.0.0.69       default      cumulus-frr-vx7jp    3.0.5.132       server21     pod-
template-generat Running  cumulus-frr:1c20addfcbd3 Fri Feb  8 01:50:50 2019
                                                          ion:1 name:cumulus-f
                                                          rr controller-revisi
                                                          on-hash:3710533951
server12:3.0.0.69       default      cumulus-frr-x7ft5    3.0.3.198       server13     pod-
template-generat Running  cumulus-frr:b0f63792732e Fri Feb  8 01:50:50 2019
                                                          ion:1 name:cumulus-f
                                                          rr controller-revisi
                                                          on-hash:3710533951
server12:3.0.0.69       kube-system  calico-etcd-btqgt    3.0.0.69        server12     k8s-
app:calico-etcd  Running  calico-etcd:72b1a16968fb Fri Feb  8 01:50:50 2019
                                                          pod-template-generat
                                                          ion:1 controller-rev
                                                          ision-hash:142071906
                                                          5
server12:3.0.0.69       kube-system  calico-kube-controll 3.0.5.132       server21
k8s-app:calico-kube- Running  calico-kube-controllers: Fri Feb  8 01:50:50 2019
                    ers-d669cc78f-bdnzk                controllers
```

```
6821bf04696f
server12:3.0.0.69       kube-system  calico-node-4g6vd    3.0.3.198       server13
k8s-app:calico-node  Running  calico-node:1046b559a50c Fri Feb  8 01:50:50 2019
                                                           pod-template-generat
install-cni:0a136851da17
                                                           ion:1 controller-rev
                                                           ision-hash:490828062
server12:3.0.0.69       kube-system  calico-node-4hg6l    3.0.0.69        server12
k8s-app:calico-node  Running  calico-node:4e7acc83f8e8 Fri Feb  8 01:50:50 2019
                                                           pod-template-generat
install-cni:a26e76de289e
                                                           ion:1 controller-rev
                                                           ision-hash:490828062
server12:3.0.0.69       kube-system  calico-node-4p66v    3.0.2.6         server23
k8s-app:calico-node  Running  calico-node:a7a44072e4e2 Fri Feb  8 01:50:50 2019
                                                           pod-template-generat
install-cni:9a19da2b2308
                                                           ion:1 controller-rev
                                                           ision-hash:490828062
server12:3.0.0.69       kube-system  calico-node-5z7k4    3.0.5.133       server22
k8s-app:calico-node  Running  calico-node:9878b0606158 Fri Feb  8 01:50:50 2019
                                                           pod-template-generat
install-cni:489f8f326cf9
                                                           ion:1 controller-rev
                                                           ision-hash:490828062
...
```

You can filter this information to focus on a particular pod:

```
cumulus@server11:~$ netq show kubernetes pod node server11
Matching kube_pod records:
Master                 Namespace    Name              IP            Node        Labels
Status   Containers             Last Changed
----------------------- ------------ -------------------- ---------------- ------------ -------------------- --------
----------------------- ----------------
server11:3.0.0.68       kube-system  calico-etcd-pfg9r    3.0.0.68       server11     k8s-
app:calico-etcd  Running  calico-etcd:f95f44b745a7 2d:14h:0m:59s
                                                                pod-template-generat
                                                                ion:1 controller-rev
                                                                ision-hash:142071906
                                                                5
server11:3.0.0.68       kube-system  calico-node-zzfkr    3.0.0.68       server11     k8s-
app:calico-node  Running  calico-node:c1ac399dd862 2d:14h:0m:59s
                                                                pod-template-generat
install-cni:60a779fdc47a
                                                                ion:1 controller-rev
                                                                ision-hash:324404111
                                                                9
server11:3.0.0.68       kube-system  etcd-server11       3.0.0.68       server11
tier:control-plane c Running  etcd:dde63d44a2f5       2d:14h:1m:44s
                                                                omponent:etcd
server11:3.0.0.68       kube-system  kube-apiserver-serve 3.0.0.68       server11
tier:control-plane c Running  kube-apiserver:0cd557bbf 2d:14h:1m:44s
                                    r11                           omponent:kube-apiser       2fe
                                                                ver
server11:3.0.0.68       kube-system  kube-controller-mana 3.0.0.68       server11
tier:control-plane c Running  kube-controller-manager: 2d:14h:1m:44s
                                    ger-server11                         omponent:kube-
```

```
contro        89b2323d09b2
                                                          ller-manager
server11:3.0.0.68       kube-system  kube-proxy-f9dt8     3.0.0.68        server11
k8s-app:kube-proxy p Running  kube-proxy:032cc82ef3f8  2d:14h:0m:59s
                                                          od-template-generati
                                                          on:1 controller-revi
                                                          sion-hash:3953509896
server11:3.0.0.68       kube-system  kube-scheduler-serve 3.0.0.68        server11
tier:control-plane c Running  kube-scheduler:c262a8071 2d:14h:1m:44s
                        r11                                 omponent:kube-schedu
3cb
                                                          ler
```

### View Kubernetes Node Information

You can view a lot of information about a node, including the pod CIDR and kubelet status.

```
cumulus@host:~$ netq server11 show kubernetes node
Matching kube_cluster records:
Master                Cluster Name     Node Name          Role       Status
Labels             Pod CIDR              Last Changed
------------------------ ---------------- -------------------- ---------- ---------------- --------------------
------------------------ ----------------
server11:3.0.0.68       default        server11           master     KubeletReady     node-
role.kubernetes 10.224.0.0/24          14h:23m:46s
                                                          .io/master: kubernet
                                                          es.io/hostname:hostd
                                                          -11 beta.kubernetes.
```

```
                                        io/arch:amd64 beta.k
                                        ubernetes.io/os:linu
                                        x
server11:3.0.0.68  default  server13    worker  KubeletReady
kubernetes.io/hostna 10.224.3.0/24   14h:19m:56s
                                        me:server13 beta.kub
                                        ernetes.io/arch:amd6
                                        4 beta.kubernetes.io
                                        /os:linux
server11:3.0.0.68  default  server22    worker  KubeletReady
kubernetes.io/hostna 10.224.1.0/24   14h:24m:31s
                                        me:server22 beta.kub
                                        ernetes.io/arch:amd6
                                        4 beta.kubernetes.io
                                        /os:linux
server11:3.0.0.68  default  server11    worker  KubeletReady
kubernetes.io/hostna 10.224.2.0/24   14h:24m:16s
                                        me:server11 beta.kub
                                        ernetes.io/arch:amd6
                                        4 beta.kubernetes.io
                                        /os:linux
server11:3.0.0.68  default  server12    worker  KubeletReady
kubernetes.io/hostna 10.224.4.0/24   14h:24m:16s
                                        me:server12 beta.kub
                                        ernetes.io/arch:amd6
                                        4 beta.kubernetes.io
                                        /os:linux
server11:3.0.0.68  default  server23    worker  KubeletReady
kubernetes.io/hostna 10.224.5.0/24   14h:24m:16s
```

```
                                              me:server23 beta.kub
                                              ernetes.io/arch:amd6
                                              4 beta.kubernetes.io
                                              /os:linux
server11:3.0.0.68   default    server24      worker   KubeletReady
kubernetes.io/hostna 10.224.6.0/24    14h:24m:1s
                                              me:server24 beta.kub
                                              ernetes.io/arch:amd6
                                              4 beta.kubernetes.io
                                              /os:linux
```

To display the kubelet or Docker version, use the `components` option on the above command. This example lists all the details of all master and worker nodes because the master's hostname — *server11* in this case — was included in the query.

```
cumulus@server11:~$ netq server11 show kubernetes node components
Matching kube_cluster records:
             Master      Cluster Name     Node Name   Kubelet
KubeProxy     Container Runt
                                                     ime
------------------------ ---------------- -------------------- ------------ ------------ ----------------- --------------
server11:3.0.0.68   default    server11      v1.9.2    v1.9.2    docker://
17.3.2  KubeletReady
server11:3.0.0.68   default    server13      v1.9.2    v1.9.2    docker://
17.3.2  KubeletReady
server11:3.0.0.68   default    server22      v1.9.2    v1.9.2    docker://
17.3.2  KubeletReady
server11:3.0.0.68   default    server11      v1.9.2    v1.9.2    docker://
```

```
17.3.2   KubeletReady
server11:3.0.0.68      default      server12        v1.9.2     v1.9.2     docker://
17.3.2   KubeletReady
server11:3.0.0.68      default      server23        v1.9.2     v1.9.2     docker://
17.3.2   KubeletReady
server11:3.0.0.68      default      server24        v1.9.2     v1.9.2     docker://
17.3.2   KubeletReady
```

To view only the details for a worker node, specify the hostname at the end of the command using the `name` option:

```
cumulus@server11:~$ netq server11 show kubernetes node components name
server13
Matching kube_cluster records:
                 Master        Cluster Name       Node Name    Kubelet
KubeProxy       Container Runt
                                                                       ime
----------------------- --------------- ------------------- ------------ ------------ ---------------- --------------
server11:3.0.0.68      default      server13        v1.9.2     v1.9.2     docker://
17.3.2   KubeletReady
```

You can view information about the replica set:

```
cumulus@server11:~$ netq server11 show kubernetes replica-set
Matching kube_replica records:
Master             Cluster Name Namespace       Replication Name
```

```
Labels          Replicas                Ready Replicas Last Changed
---------------------- ------------ --------------- ---------------------------- --------------------
-------------------------------- -------------- ----------------
server11:3.0.0.68      default     default        influxdb-6cdb566dd
app:influx         1                     1          14h:19m:28s
server11:3.0.0.68      default     default        nginx-8586cf59
run:nginx          3                     3          14h:24m:39s
server11:3.0.0.68      default     default        httpd-5456469bfd
app:httpd          1                     1          14h:19m:28s
server11:3.0.0.68      default     kube-system     kube-dns-6f4fd4bdf          k8s-
app:kube-dns     1                     1          14h:27m:9s
server11:3.0.0.68      default     kube-system     calico-kube-controllers-d669cc
k8s-app:calico-kube- 1                          1          14h:27m:9s
                                  78f                    controllers
```

You can view information about the daemon set:

```
cumulus@server11:~$ netq server11 show kubernetes daemon-set namespace
default
Matching kube_daemonset records:
Master                Cluster Name Namespace       Daemon Set Name
Labels          Desired Count Ready Count Last Changed
---------------------- ------------ --------------- ---------------------------- -------------------- ------------
----------- ----------------
server11:3.0.0.68      default     default        cumulus-frr                k8s-
app:cumulus-frr  6          6         14h:25m:37s
```

You can view information about the pod:

```
cumulus@server11:~$ netq server11 show kubernetes pod namespace default
label nginx
Matching kube_pod records:
Master                 Namespace    Name               IP             Node        Labels
Status   Containers              Last Changed
------------------------ ------------ -------------------- ---------------- ------------ -------------------- --------
------------------------ ----------------
server11:3.0.0.68       default      nginx-8586cf59-26pj5 10.244.9.193     server24
run:nginx           Running  nginx:6e2b65070c86       14h:25m:24s
server11:3.0.0.68       default      nginx-8586cf59-c82ns 10.244.40.128    server12
run:nginx           Running  nginx:01b017c26725       14h:25m:24s
server11:3.0.0.68       default      nginx-8586cf59-wjwgp 10.244.49.64     server22
run:nginx           Running  nginx:ed2b4254e328       14h:25m:24s

cumulus@server11:~$ netq server11 show kubernetes pod namespace default
label app
Matching kube_pod records:
Master                 Namespace    Name               IP             Node        Labels
Status   Containers              Last Changed
------------------------ ------------ -------------------- ---------------- ------------ -------------------- --------
------------------------ ----------------
server11:3.0.0.68       default      httpd-5456469bfd-bq9 10.244.49.65     server22
app:httpd           Running  httpd:79b7f532be2d       14h:20m:34s
                              zm
server11:3.0.0.68       default      influxdb-6cdb566dd-8 10.244.162.128   server13
app:influx          Running  influxdb:15dce703cdec    14h:20m:34s
                              9lwn
```

You can view information about the replication controller:

```
cumulus@server11:~$ netq server11 show kubernetes replication-controller
No matching kube_replica records found
```

You can view information about a deployment:

```
cumulus@server11:~$ netq server11 show kubernetes deployment name nginx
Matching kube_deployment records:
Master                   Namespace       Name             Replicas                        Ready
Replicas Labels                      Last Changed
------------------------ --------------- -------------------- ---------------------------------- --------------
------------------------------ ----------------
server11:3.0.0.68        default         nginx            3                               3
run:nginx                  14h:27m:20s
```

You can search for information using labels as well. The label search is similar to a "contains" regular expression search. In the following example, we are looking for all nodes that contain *kube* in the replication set name or label:

```
cumulus@server11:~$ netq server11 show kubernetes replica-set label kube
Matching kube_replica records:
Master                   Cluster Name Namespace        Replication Name
Labels             Replicas                        Ready Replicas Last Changed
------------------------ ------------ ---------------- ------------------------------ --------------------
---------------------------------- -------------- ----------------
```

```
server11:3.0.0.68      default     kube-system     kube-dns-6f4fd4bdf          k8s-
app:kube-dns     1                          1           14h:30m:41s
server11:3.0.0.68      default     kube-system     calico-kube-controllers-d669cc
k8s-app:calico-kube- 1                          1           14h:30m:41s
                                        78f                  controllers
```

### View Container Connectivity

You can view the connectivity graph of a Kubernetes pod, seeing its replica set, deployment or service level. The impact/connectivity graph starts with the server where the pod is deployed, and shows the peer for each server interface.

```
cumulus@server11:~$ netq server11 show kubernetes deployment name nginx
connectivity
nginx -- nginx-8586cf59-wjwgp -- server22:swp1:torbond1 --
swp7:hostbond3:torc-21
                    -- server22:swp2:torbond1 -- swp7:hostbond3:torc-22
                    -- server22:swp3:NetQBond-2 -- swp20:NetQBond-20:edge01
                    -- server22:swp4:NetQBond-2 -- swp20:NetQBond-20:edge02
    -- nginx-8586cf59-c82ns -- server12:swp2:NetQBond-1 --
swp23:NetQBond-23:edge01
                    -- server12:swp3:NetQBond-1 -- swp23:NetQBond-23:edge02
                    -- server12:swp1:swp1 -- swp6:VlanA-1:tor-1
    -- nginx-8586cf59-26pj5 -- server24:swp2:NetQBond-1 --
swp29:NetQBond-29:edge01
                    -- server24:swp3:NetQBond-1 -- swp29:NetQBond-29:edge02
                    -- server24:swp1:swp1 -- swp8:VlanA-1:tor-2
```

View Kubernetes Service Connectivity and Impact

You can show the Kubernetes services in a cluster:

```
cumulus@server11:~$ netq show kubernetes service
Matching kube_service records:
Master              Namespace      Service Name       Labels      Type      Cluster
IP      External IP      Ports                    Last Changed
---------------------- --------------- ------------------- ------------ ---------- ---------------- ----------------
--------------------------------- ----------------
server11:3.0.0.68      default       kubernetes                 ClusterIP
10.96.0.1                  TCP:443                    2d:13h:45m:30s
server11:3.0.0.68      kube-system     calico-etcd        k8s-app:cali ClusterIP
10.96.232.136              TCP:6666                   2d:13h:45m:27s
                                                      co-etcd
server11:3.0.0.68      kube-system     kube-dns           k8s-app:kube ClusterIP
10.96.0.10                 UDP:53 TCP:53              2d:13h:45m:28s
                                                      -dns
server12:3.0.0.69      default       kubernetes                 ClusterIP
10.96.0.1                  TCP:443                    2d:13h:46m:24s
server12:3.0.0.69      kube-system     calico-etcd        k8s-app:cali ClusterIP
10.96.232.136              TCP:6666                   2d:13h:46m:20s
                                                      co-etcd
server12:3.0.0.69      kube-system     kube-dns           k8s-app:kube ClusterIP
10.96.0.10                 UDP:53 TCP:53              2d:13h:46m:20s
                                                      -dns
```

And get detailed information about a Kubernetes service:

```
cumulus@server11:~$ netq show kubernetes service name calico-etcd
Matching kube_service records:
Master                 Namespace       Service Name        Labels       Type       Cluster
IP       External IP      Ports                             Last Changed
----------------------- ---------------- ------------------- ------------ ---------- ---------------- ----------------
---------------------------------- ----------------
server11:3.0.0.68       kube-system      calico-etcd         k8s-app:cali ClusterIP
10.96.232.136                TCP:6666                        2d:13h:48m:10s
                                                co-etcd
server12:3.0.0.69       kube-system      calico-etcd         k8s-app:cali ClusterIP
10.96.232.136                TCP:6666                        2d:13h:49m:3s
                                                co-etcd
```

To see the connectivity of a given Kubernetes service, run:

```
cumulus@server11:~$ netq show kubernetes service name calico-etcd connectivity
calico-etcd -- calico-etcd-pfg9r -- server11:swp1:torbond1 --
swp6:hostbond2:torc-11
                          -- server11:swp2:torbond1 -- swp6:hostbond2:torc-12
                          -- server11:swp3:NetQBond-2 -- swp16:NetQBond-16:edge01
                          -- server11:swp4:NetQBond-2 -- swp16:NetQBond-16:edge02
calico-etcd -- calico-etcd-btqgt -- server12:swp1:torbond1 --
swp7:hostbond3:torc-11
                          -- server12:swp2:torbond1 -- swp7:hostbond3:torc-12
                          -- server12:swp3:NetQBond-2 -- swp17:NetQBond-17:edge01
                          -- server12:swp4:NetQBond-2 -- swp17:NetQBond-17:edge02
```

To see the impact of a given Kubernetes service, run:

```
cumulus@server11:~$ netq server11 show impact kubernetes service name calico-
etcd
calico-etcd -- calico-etcd-pfg9r -- server11:swp1:torbond1 --
swp6:hostbond2:torc-11
                                  -- server11:swp2:torbond1 -- swp6:hostbond2:torc-12
                                  -- server11:swp3:NetQBond-2 -- swp16:NetQBond-16:edge01
                                  -- server11:swp4:NetQBond-2 -- swp16:NetQBond-16:edge02
```

### View Kubernetes Cluster Configuration in the Past

You can use the "time machine" features of NetQ on a Kubernetes cluster, using the `around` option to go back in time to check the network status and identify any changes that occurred on the network.

This example shows the current state of the network. Notice there is a node named *server23*. server23 is there because the node *server22* went down and Kubernetes spun up a third replica on a different host to satisfy the deployment requirement.

```
cumulus@redis-1:~$ netq server11 show kubernetes deployment name nginx
connectivity
nginx -- nginx-8586cf59-fqtnj -- server12:swp2:NetQBond-1 --
swp23:NetQBond-23:edge01
                               -- server12:swp3:NetQBond-1 -- swp23:NetQBond-23:edge02
                               -- server12:swp1:swp1 -- swp6:VlanA-1:tor-1
      -- nginx-8586cf59-8g487 -- server24:swp2:NetQBond-1 --
swp29:NetQBond-29:edge01
```

```
                    -- server24:swp3:NetQBond-1 -- swp29:NetQBond-29:edge02
                    -- server24:swp1:swp1 -- swp8:VlanA-1:tor-2
    -- nginx-8586cf59-2hb8t -- server23:swp1:swp1 -- swp7:VlanA-1:tor-2
                    -- server23:swp2:NetQBond-1 -- swp28:NetQBond-28:edge01
                    -- server23:swp3:NetQBond-1 -- swp28:NetQBond-28:edge02
```

You can see this by going back in time 10 minutes. *server23* was not present, whereas *server22* **was** present:

```
cumulus@redis-1:~$ netq server11 show kubernetes deployment name nginx
connectivity around 10m
nginx -- nginx-8586cf59-fqtnj -- server12:swp2:NetQBond-1 --
swp23:NetQBond-23:edge01
                    -- server12:swp3:NetQBond-1 -- swp23:NetQBond-23:edge02
                    -- server12:swp1:swp1 -- swp6:VlanA-1:tor-1
    -- nginx-8586cf59-2xxs4 -- server22:swp1:torbond1 -- swp7:hostbond3:torc-21
                    -- server22:swp2:torbond1 -- swp7:hostbond3:torc-22
                    -- server22:swp3:NetQBond-2 -- swp20:NetQBond-20:edge01
                    -- server22:swp4:NetQBond-2 -- swp20:NetQBond-20:edge02
    -- nginx-8586cf59-8g487 -- server24:swp2:NetQBond-1 --
swp29:NetQBond-29:edge01
                    -- server24:swp3:NetQBond-1 -- swp29:NetQBond-29:edge02
                    -- server24:swp1:swp1 -- swp8:VlanA-1:tor-2
```

You can determine the impact on the Kubernetes deployment in the event a host or switch goes down. The output is color coded (not shown in the example below) so you can clearly see the impact: green shows no impact, yellow shows partial impact, and red shows full impact.

```
cumulus@server11:~$ netq torc-21 show impact kubernetes deployment name
nginx
nginx -- nginx-8586cf59-wjwgp -- server22:swp1:torbond1 --
swp7:hostbond3:torc-21
                    -- server22:swp2:torbond1 -- swp7:hostbond3:torc-22
                    -- server22:swp3:NetQBond-2 -- swp20:NetQBond-20:edge01
                    -- server22:swp4:NetQBond-2 -- swp20:NetQBond-20:edge02
    -- nginx-8586cf59-c82ns -- server12:swp2:NetQBond-1 --
swp23:NetQBond-23:edge01
                    -- server12:swp3:NetQBond-1 -- swp23:NetQBond-23:edge02
                    -- server12:swp1:swp1 -- swp6:VlanA-1:tor-1
    -- nginx-8586cf59-26pj5 -- server24:swp2:NetQBond-1 --
swp29:NetQBond-29:edge01
                    -- server24:swp3:NetQBond-1 -- swp29:NetQBond-29:edge02
                    -- server24:swp1:swp1 -- swp8:VlanA-1:tor-2
cumulus@server11:~$ netq server12 show impact kubernetes deployment name
nginx
nginx -- nginx-8586cf59-wjwgp -- server22:swp1:torbond1 --
swp7:hostbond3:torc-21
                    -- server22:swp2:torbond1 -- swp7:hostbond3:torc-22
                    -- server22:swp3:NetQBond-2 -- swp20:NetQBond-20:edge01
                    -- server22:swp4:NetQBond-2 -- swp20:NetQBond-20:edge02
    -- nginx-8586cf59-c82ns -- server12:swp2:NetQBond-1 --
swp23:NetQBond-23:edge01
                    -- server12:swp3:NetQBond-1 -- swp23:NetQBond-23:edge02
                    -- server12:swp1:swp1 -- swp6:VlanA-1:tor-1
```

```
    -- nginx-8586cf59-26pj5 -- server24:swp2:NetQBond-1 --
swp29:NetQBond-29:edge01
                        -- server24:swp3:NetQBond-1 -- swp29:NetQBond-29:edge02
```

# Manage NetQ Agents

At various points in time, you might want to change which network nodes are being monitored by NetQ or look more closely at a network node for troubleshooting purposes. Adding the NetQ Agent to a switch or host is described in Install NetQ. Viewing the status of an Agent, disabling an Agent, and managing NetQ Agent logging are presented.

## View NetQ Agent Status

To view the health of your NetQ Agents, use the `netq show agents` command:

```
netq [<hostname>] show agents [fresh | dead | rotten | opta] [around <text-time>] [json]
```

You can view the status for a given switch, host or NetQ server. You can also filter by the status as well as view the status at a time in the past.

To view the current status of all NetQ Agents:

```
cumulus@switch~:$ netq show agents
Matching agents records:
Hostname        Status        NTP Sync Version                    Sys Uptime
Agent Uptime          Reinitialize Time        Last Changed
---------------- --------------- -------- --------------------------------- ------------------------
```

```
------------------------ ------------------------- ------------------------
exit-1          Fresh         yes      2.2.1-cl3u19~1564503011.e3b463d      1d:4h:35m:
11s          1d:4h:14m:34s          1d:4h:14m:34s          Wed Jul 31 16:50:40 2019
exit-2          Fresh         yes      2.2.1-cl3u19~1564503011.e3b463d      1d:4h:35m:
11s          1d:4h:14m:30s          1d:4h:14m:30s          Wed Jul 31 16:51:07 2019
firewall-1       Fresh         yes      2.2.1-ub16.04u19~1564494614.6fed81f  1d:4h:
35m:11s          1d:4h:14m:24s          1d:4h:14m:24s          Wed Jul 31 16:51:13
2019
firewall-2       Fresh         yes      2.2.1-rh7u19~1564496494.6fed81f      1d:4h:34m:
35s          1d:4h:14m:18s          1d:4h:14m:18s          Wed Jul 31 16:51:06 2019
hostd-11         Fresh         yes      2.2.1-ub16.04u19~1564494614.6fed81f  1d:4h:
35m:6s           1d:4h:14m:6s           1d:4h:14m:6s           Wed Jul 31 16:51:16 2019
hostd-12         Fresh         yes      2.2.1-rh7u19~1564496494.6fed81f      1d:4h:34m:
40s          1d:4h:14m:2s           1d:4h:14m:2s           Wed Jul 31 16:51:40 2019
...
```

To view NetQ Agents that are not communicating:

```
cumulus@switch~:$ netq show agents rotten
No matching agents records found
```

To view NetQ Agent status on the NetQ Server or Appliance, run the following command from a node:

```
cumulus@leaf01~:$ netq show agents opta
Matching agents records:
```

```
Hostname          Status           NTP Sync Version                          Sys Uptime
Agent Uptime             Reinitialize Time          Last Changed
----------------- ---------------- -------- ------------------------------------ -------------------------
------------------------- -------------------------- -------------------------
10-20-14-157      Fresh           yes      2.2.1-cl3u19~1564299612.73c7ab4      1d:5h:
40m:41s          6m:34.417s            6m:34.417s            Wed Jul 31 22:12:40 2019
```

## Modify the Configuration of the NetQ Agent on a Node

The agent configuration commands enable you to add and remove agents from switches and hosts, start and stop agent operations, add and remove Kubernetes container monitoring, add or remove sensors, debug the agent, and add or remove FRR (FRRouting).

> NOTE
>
> Commands apply to one agent at a time, and are run from the switch or host where the NetQ Agent resides.

The agent configuration commands include:

```
netq config add agent frr-monitor [<text-frr-docker-name>]
netq config add agent kubernetes-monitor [poll-period <text-duration-period>]
netq config add agent loglevel [debug|error|info|warning]
netq config add agent sensors
netq config add agent server <text-opta-ip> [port <text-opta-port>] [vrf <text-vrf-
name>]
```

```
netq config (start|stop|status|restart) agent
netq config del agent (agent-url|frr-monitor|kubernetes-monitor|loglevel|
sensors|server)
netq config show agent [frr-monitor|kubernetes-monitor|loglevel|sensors] [json]
```

This example shows how to specify the IP address and optionally a specific port on the NetQ Platform where agents should send their data.

```
cumulus@switch~:$ netq config add agent server 10.0.0.23
```

This example shows how to configure the agent to send sensor data.

```
cumulus@switch~:$ netq config add agent sensors
```

This example shows how to start monitoring with Kubernetes.

```
cumulus@switch:~$ netq config add kubernetes-monitor
```

> NOTE
>
> After making configuration changes to your agents, you must restart the agent for the changes to take effect. Use the `netq config restart agent` command.

## Disable the NetQ Agent on a Node

You can temporarily disable NetQ Agent on a node. Disabling the agent maintains the activity history in the NetQ database.

To disable NetQ Agent on a node, run the following command from the node:

```
cumulus@switch:~$ netq config stop agent
```

## Remove the NetQ Agent from a Node

You can decommission a NetQ Agent on a given node. You might need to do this when you:

- RMA the switch or host being monitored
- Change the hostname of the switch or host being monitored
- Move the switch or host being monitored from one data center to another

> NOTE
>
> Decommissioning the node removes the agent server settings from the local configuration file.

To decommission a node from the NetQ database:

1. On the given node, stop and disable the NetQ Agent service.

```
cumulus@switch:~$ sudo systemctl stop netq-agent
cumulus@switch:~$ sudo systemctl disable netq-agent
```

2. On the NetQ Appliance or Platform, decommission the node.

```
cumulus@netq-appliance:~$ netq decommission <hostname>
```

## Configure Logging for a NetQ Agent

The logging level used for a NetQ Agent determines what types of events are logged about the NetQ Agent on the switch or host.

First, you need to decide what level of logging you want to configure. You can configure the logging level to be the same for every NetQ Agent, or selectively increase or decrease the logging level for a NetQ Agent on a problematic node.

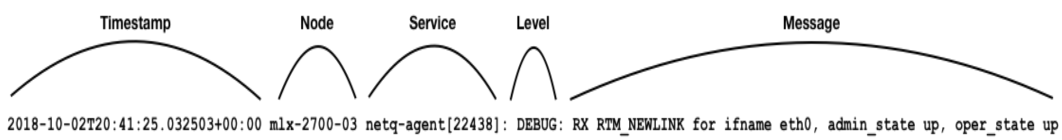
| Logging Level | Description |
| --- | --- |
| debug | Sends notifications for all debugging-related, informational, warning, and error messages. |
| info | Sends notifications for informational, warning, and error messages (default). |
| warning | Sends notifications for warning and error messages. |
| error | Sends notifications for errors messages. |

You can view the NetQ Agent log directly. Messages have the following structure:

`<timestamp> <node> <service>[PID]: <level>: <message>`

| Element | Description |
|---|---|
| timestamp | Date and time event occurred in UTC format |
| node | Hostname of network node where event occurred |
| service [PID] | Service and Process IDentifier that generated the event |
| level | Logging level in which the given event is classified; *debug*, *error*, *info*, or *warning* |
| message | Text description of event, including the node where the event occurred |

For example:




This example shows a portion of a NetQ Agent log with debug level logging.

```
...
2019-02-16T18:45:53.951124+00:00 spine-1 netq-agent[8600]: INFO: OPTA
Discovery exhibit url hydra-09.cumulusnetworks.com port 4786
2019-02-16T18:45:53.952035+00:00 spine-1 netq-agent[8600]: INFO: OPTA
Discovery Agent ID spine-1
2019-02-16T18:45:53.960152+00:00 spine-1 netq-agent[8600]: INFO: Received
Discovery Response 0
2019-02-16T18:46:54.054160+00:00 spine-1 netq-agent[8600]: INFO: OPTA
Discovery exhibit url hydra-09.cumulusnetworks.com port 4786
2019-02-16T18:46:54.054509+00:00 spine-1 netq-agent[8600]: INFO: OPTA
Discovery Agent ID spine-1
2019-02-16T18:46:54.057273+00:00 spine-1 netq-agent[8600]: INFO: Received
```

```
Discovery Response 0
2019-02-16T18:47:54.157985+00:00 spine-1 netq-agent[8600]: INFO: OPTA
Discovery exhibit url hydra-09.cumulusnetworks.com port 4786
2019-02-16T18:47:54.158857+00:00 spine-1 netq-agent[8600]: INFO: OPTA
Discovery Agent ID spine-1
2019-02-16T18:47:54.171170+00:00 spine-1 netq-agent[8600]: INFO: Received
Discovery Response 0
2019-02-16T18:48:54.260903+00:00 spine-1 netq-agent[8600]: INFO: OPTA
Discovery exhibit url hydra-09.cumulusnetworks.com port 4786
...
```

**Example: Configure debug-level logging**

1. Set the logging level to *debug.*

   ```
   cumulus@switch:~$ netq config add agent loglevel debug
   ```

2. Restart the NetQ Agent.

   ```
   cumulus@switch:~$ netq config restart agent
   ```

3. Optionally, verify connection to the NetQ platform by viewing the `netq-agent.log` messages.

**Example: Configure warning-level logging**

```
cumulus@switch:~$ netq config add agent loglevel warning
cumulus@switch:~$ netq config restart agent
```

**Example: Disable Agent Logging**

If you have set the logging level to *debug* for troubleshooting, it is recommended that you either change the logging level to a less heavy mode or completely disable agent logging altogether when you are finished troubleshooting.

To change the logging level, run the following command and restart the agent service:

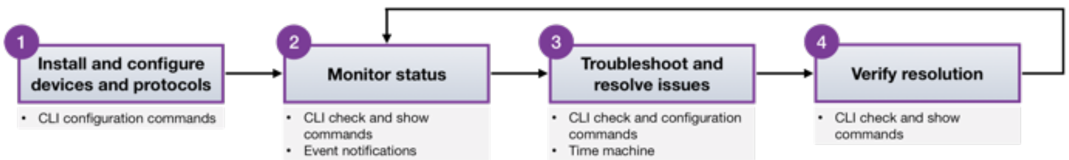
```
cumulus@switch:~$ netq config add agent loglevel <LOG_LEVEL>
cumulus@switch:~$ netq config restart agent
```

To disable all logging:

```
cumulus@switch:~$ netq config del agent loglevel
cumulus@switch:~$ netq config restart agent
```

# Investigate NetQ Issues

Monitoring of systems inevitably leads to the need to troubleshoot and resolve the issues found. In fact network management follows a common pattern as shown in this diagram.




This topic describes some of the tools and commands you can use to troubleshoot issues with the network and NetQ itself. Some example scenarios are included here: - viewing configuration and log files, - verifying NetQ Agent health, - investigating recent events, and - investigating events from the past - running a trace.

Try looking at the specific protocol or service, or particular devices as well. If none of these produce a resolution, you can capture a log to use in discussion with the Cumulus Networks support team.

## Browse Configuration and Log Files

To aid in troubleshooting issues with NetQ, there are the following configuration and log files that can provide insight into the root cause of the issue:

| File | Description |
|---|---|
| `/etc/netq/netq.yml` | The NetQ configuration file. This file appears only if you installed either the `netq-apps` package or the NetQ Agent on the system. |

| File | Description |
| --- | --- |
| /var/log/netqd.log | The NetQ daemon log file for the NetQ CLI. This log file appears only if you installed the netq-apps package on the system. |
| /var/log/netq-agent.log | The NetQ Agent log file. This log file appears only if you installed the NetQ Agent on the system. |

## Check NetQ Agent Health

Checking the health of the NetQ Agents is a good way to start troubleshooting NetQ on your network. If any agents are rotten, meaning three heartbeats in a row were not sent, then you can investigate the rotten node. In the example below, the NetQ Agent on *server01* is rotten, so you know where to start looking for problems:

```
cumulus@switch:$ netq check agents
Checked nodes: 12,

Rotten nodes: 1
netq@446c0319c06a:/$ netq show agents
Node      Status    Sys Uptime    Agent Uptime
--------  --------  ------------  --------------
exit01
Fresh
    8h ago       4h ago
exit02
Fresh
    8h ago       4h ago
leaf01
Fresh
```

```
    8h ago      4h ago
leaf02
Fresh
    8h ago      4h ago
leaf03
Fresh
    8h ago      4h ago
leaf04
Fresh
    8h ago      4h ago
server01
Rotten
   4h ago      4h ago
server02
Fresh
    4h ago      4h ago
server03
Fresh
    4h ago      4h ago
server04
Fresh
    4h ago      4h ago
spine01
Fresh
    8h ago      4h ago
spine02
Fresh
    8h ago      4h ago
```

# Diagnose an Event after It Occurs

NetQ provides users with the ability to go back in time to replay the network state, see fabric-wide event change logs and root cause state deviations. The NetQ Telemetry Server maintains data collected by NetQ agents in a time-series database, making fabric-wide events available for analysis. This enables you to replay and analyze network-wide events for better visibility and to correlate patterns. This allows for root-cause analysis and optimization of network configs for the future.

NetQ provides a number of commands for diagnosing past events.

NetQ records network events and stores them in its database. You can view the events through a third-party notification application like PagerDuty or Slack or use `netq show events` to look for any changes made to the runtime configuration that may have triggered the alert, then use `netq trace` to track the connection between the nodes.

The `netq trace` command traces the route of an IP or MAC address from one endpoint to another. It works across bridged, routed and VXLAN connections, computing the path using available data instead of sending real traffic — this way, it can be run from anywhere. It performs MTU and VLAN consistency checks for every link along the path.

For example, say you get an alert about a BGP session failure. You can quickly run `netq check bgp` to determine what sessions failed:

```
cumulus@switch:~$ netq check bgp
Total Nodes: 25, Failed Nodes: 3, Total Sessions: 220 , Failed Sessions: 24,
Hostname        VRF           Peer Name        Peer Hostname
Reason                                    Last Changed
---------------- -------------- ---------------- ---------------- -------------------------------------------
------------------------
exit-1          DataVrf1080     swp6.2          firewall-1       BGP session with peer
```

```
firewall-1 swp6.2: AFI/ 1d:7h:56m:9s
                                             SAFI evpn not activated on peer
exit-1          DataVrf1080     swp7.2          firewall-2       BGP session with peer
firewall-2 (swp7.2 vrf  1d:7h:49m:31s
                                             DataVrf1080) failed,
                                             reason: Peer not configured
exit-1          DataVrf1081     swp6.3          firewall-1       BGP session with peer
firewall-1 swp6.3: AFI/ 1d:7h:56m:9s
                                             SAFI evpn not activated on peer
exit-1          DataVrf1081     swp7.3          firewall-2       BGP session with peer
firewall-2 (swp7.3 vrf  1d:7h:49m:31s
                                             DataVrf1081) failed,
                                             reason: Peer not configured
```

You can run a trace from spine01 to leaf02, which has the IP address 10.1.20.252:

```
cumulus@switch:~$ netq trace 10.1.20.252 from spine01 around 5m
spine01 -- spine01:swp1 -- leaf01:vlan20
        -- spine01:swp2 -- leaf02:vlan20
```

Then you can check what’s changed on the network to help you identify the problem.

```
cumulus@switch:~$ netq show events type bgp
Matching events records:
Hostname          Message Type Severity Message                          Timestamp
----------------- ------------ -------- --------------------------------- -------------------------
```

```
leaf21     bgp     info   BGP session with peer spine-1 swp3. 1d:8h:35m:19s
                          3 vrf DataVrf1081 state changed fro
                          m failed to Established
leaf21     bgp     info   BGP session with peer spine-2 swp4. 1d:8h:35m:19s
                          3 vrf DataVrf1081 state changed fro
                          m failed to Established
leaf21     bgp     info   BGP session with peer spine-3 swp5. 1d:8h:35m:19s
                          3 vrf DataVrf1081 state changed fro
                          m failed to Established
leaf21     bgp     info   BGP session with peer spine-1 swp3. 1d:8h:35m:19s
                          2 vrf DataVrf1080 state changed fro
                          m failed to Established
leaf21     bgp     info   BGP session with peer spine-3 swp5. 1d:8h:35m:19s
                          2 vrf DataVrf1080 state changed fro
                          m failed to Established
...
```

## Use NetQ as a Time Machine

With NetQ, you can travel back to a specific point in time or a range of times to help you isolate errors and issues.

For example, if you think you had an issue with your sensors last night, you can check the sensors on all your nodes around the time you think the issue occurred:

```
cumulus@leaf01:~$ netq check sensors around 12h
Total Nodes: 25, Failed Nodes: 0, Checked Sensors: 221, Failed Sensors: 0
```

Or you can specify a range of times using the `between` option. The units of time you can specify are second (*s*), minutes (*m*), hours (*h*) and days (*d*). Always specify the most recent time first, then the more distant time. For example, to see the changes made to the network between the past minute and 5 minutes ago, you'd run:

```
cumulus@switch:/$ netq show events between now and 48h
Matching events records:
Hostname         Message Type Severity Message                          Timestamp
----------------- ------------ -------- --------------------------------- -------------------------
leaf21           configdiff   info     leaf21 config file ptm was modified 1d:8h:38m:6s
leaf21           configdiff   info     leaf21 config file lldpd was modifi 1d:8h:38m:6s
                                       ed
leaf21           configdiff   info     leaf21 config file interfaces was m 1d:8h:38m:6s
                                       odified
leaf21           configdiff   info     leaf21 config file frr was modified 1d:8h:38m:6s
leaf12           configdiff   info     leaf12 config file ptm was modified 1d:8h:38m:11s
leaf12           configdiff   info     leaf12 config file lldpd was modifi 1d:8h:38m:11s
                                       ed
leaf12           configdiff   info     leaf12 config file interfaces was m 1d:8h:38m:11s
                                       odified
leaf12           configdiff   info     leaf12 config file frr was modified 1d:8h:38m:11s
leaf11           configdiff   info     leaf11 config file ptm was modified 1d:8h:38m:22s
...
```

You can travel back in time 5 minutes and run a trace from spine02 to exit01, which has the IP address 27.0.0.1:

```
cumulus@leaf01:~$ netq trace 27.0.0.1 from spine02 around 5m
Detected Routing Loop. Node exit01 (now via Local Node exit01 and Ports swp6
<==> Remote  Node/s spine01 and Ports swp3) visited twice.
Detected Routing Loop. Node spine02 (now via mac:00:02:00:00:00:15) visited
twice.
spine02 -- spine02:swp3 -- exit01:swp6.4 -- exit01:swp3 -- exit01
                   -- spine02:swp7  -- spine02
```

## Trace Paths in a VRF

The `netq trace` command works with VRFs as well:

```
cumulus@leaf01:~$ netq trace 10.1.20.252 from spine01 vrf default around 5m
spine01 -- spine01:swp1 -- leaf01:vlan20
       -- spine01:swp2 -- leaf02:vlan20
```

## Generate a Support File

The `opta-support` command generates an archive of useful information for troubleshooting issues with NetQ. It is an extension of the `cl-support` command in Cumulus Linux. It provides information about the NetQ Platform configuration and runtime statistics as well as output from the `docker ps` command. The Cumulus Networks support team may request the output of this command when assisting with any issues that you could not solve with your own troubleshooting. Run the following command:

```
cumulus@switch:~$ opta-support
```

# Resolve MLAG Issues

This topic outlines a few scenarios that illustrate how you use NetQ to troubleshoot MLAG on Cumulus Linux switches. Each starts with a log message that indicates the current MLAG state.

NetQ can monitor many aspects of an MLAG configuration, including:

- Verifying the current state of all nodes
- Verifying the dual connectivity state
- Checking that the peer link is part of the bridge
- Verifying whether MLAG bonds are not bridge members
- Verifying whether the VXLAN interface is not a bridge member
- Checking for remote-side service failures caused by `systemctl`
- Checking for VLAN-VNI mapping mismatches
- Checking for layer 3 MTU mismatches on peerlink subinterfaces
- Checking for VXLAN active-active address inconsistencies
- Verifying that STP priorities are the same across both peers

## Scenario: All Nodes Are Up

When the MLAG configuration is running smoothly, NetQ sends out a message that all nodes are up:

```
2017-05-22T23:13:09.683429+00:00 noc-pr netq-notifier[5501]: INFO: CLAG: All nodes are up
```

Running `netq show clag` confirms this:

```
cumulus@switch:~$ netq show clag
Matching clag records:
Hostname         Peer             SysMac            State      Backup #Bond #Dual Last
Changed
                                                                        s
---------------- ---------------- ----------------- ---------- ------ ----- ----- ------------------------
spine01(P)       spine02          00:01:01:10:00:01  up         up     24    24    Thu Feb  7
18:30:49 2019
spine02          spine01(P)       00:01:01:10:00:01  up         up     24    24    Thu Feb  7
18:30:53 2019
leaf01(P)        leaf02           44:38:39:ff:ff:01  up         up     12    12    Thu Feb  7
18:31:15 2019
leaf02           leaf01(P)        44:38:39:ff:ff:01  up         up     12    12    Thu Feb  7
18:31:20 2019
leaf03(P)        leaf04           44:38:39:ff:ff:02  up         up     12    12    Thu Feb  7
18:31:26 2019
leaf04           leaf03(P)        44:38:39:ff:ff:02  up         up     12    12    Thu Feb  7
18:31:30 2019
```

You can also verify a specific node is up:

```
cumulus@switch:~$ netq spine01 show clag
Matching clag records:
Hostname         Peer             SysMac            State      Backup #Bond #Dual Last
Changed
```

```
s
---------------- ---------------- ----------------- ---------- ------ ----- ----- ------------------------
spine01(P)     spine02       00:01:01:10:00:01  up      up    24    24    Thu Feb  7
18:30:49 2019
```

Similarly, checking the MLAG state with NetQ also confirms this:

```
cumulus@switch:~$ netq check clag
Checked Nodes: 6, Failed Nodes: 0
```

When you are logged directly into a switch, you can run `clagctl` to get the state:

```
cumulus@switch:/var/log# sudo clagctl

The peer is alive
Peer Priority, ID, and Role: 4096 00:02:00:00:00:4e primary
Our Priority, ID, and Role: 8192 44:38:39:00:a5:38 secondary
Peer Interface and IP: peerlink-3.4094 169.254.0.9
VxLAN Anycast IP: 36.0.0.20
Backup IP: 27.0.0.20 (active)
System MAC: 44:38:39:ff:ff:01

CLAG Interfaces
Our Interface    Peer Interface   CLAG Id Conflicts          Proto-Down Reason
---------------- ---------------- ------- ------------------ -----------------
vx-38         vx-38          -      -                -
```

```
vx-33         vx-33         -    -             -
hostbond4     hostbond4     1    -             -
hostbond5     hostbond5     2    -             -
vx-37         vx-37         -    -             -
vx-36         vx-36         -    -             -
vx-35         vx-35         -    -             -
vx-34         vx-34         -    -             -
```

## Scenario: Dual-connected Bond Is Down

When dual connectivity is lost in an MLAG configuration, you receive messages from NetQ similar to the following:

```
2017-05-22T23:14:40.290918+00:00 noc-pr netq-notifier[5501]: WARNING: LINK: 1
link(s) are down. They are: spine01 hostbond5
2017-05-22T23:14:53.081480+00:00 noc-pr netq-notifier[5501]: WARNING: CLAG: 1
node(s) have failures. They are: spine01
2017-05-22T23:14:58.161267+00:00 noc-pr netq-notifier[5501]: WARNING: CLAG: 2
node(s) have failures. They are: spine01, leaf01
```

To begin your investigation, show the status of the `clagd` service:

```
cumulus@switch:~$ netq spine01 show services clagd

Matching services records:
Hostname        Service         PID   VRF         Enabled Active Monitored
Status        Uptime            Last Changed
```

```
---------------- -------------------- ----- -------------- ------- ------ --------- ----------------
------------------------ ------------------------
spine01         clagd           2678  default       yes     yes    yes     ok           23h:
57m:16s           Thu Feb  7 18:30:49 2019
```

Checking the MLAG status provides the reason for the failure:

```
cumulus@switch:~$ netq check clag
Checked Nodes: 6, Warning Nodes: 2
Node           Reason
--------------- ------------------------------------------------------------------------
spine01         Link Down: hostbond5
leaf01          Singly Attached Bonds: hostbond5
```

You can retrieve the output in JSON format for export to another tool:

```
cumulus@switch:~$ netq check clag json
{
    "warningNodes": [
        {
            "node": "spine01",
            "reason": "Link Down: hostbond5"
        }
        ,
        {
            "node": "lea01",
```

```
            "reason": "Singly Attached Bonds: hostbond5"
        }
    ],
    "failedNodes":[
    ],
    "summary":{
        "checkedNodeCount":6,
        "failedNodeCount":0,
        "warningNodeCount":2
    }
}
```

After you fix the issue, you can show the MLAG state to see if all the nodes are up. The notifications from NetQ indicate all nodes are UP, and the `netq check` flag also indicates there are no failures.

```
cumulus@switch:~$ netq show clag

Matching clag records:
Hostname         Peer             SysMac            State      Backup #Bond #Dual Last
Changed
                                                    s
---------------- ---------------- ----------------- ---------- ------ ----- ----- ------------------------
spine01(P)       spine02          00:01:01:10:00:01  up        up     24    24    Thu Feb  7
18:30:49 2019
spine02          spine01(P)       00:01:01:10:00:01  up        up     24    24    Thu Feb  7
18:30:53 2019
leaf01(P)        leaf02           44:38:39:ff:ff:01  up        up     12    12    Thu Feb  7
```

```
18:31:15 2019
leaf02        leaf01(P)      44:38:39:ff:ff:01  up      up    12    12    Thu Feb  7
18:31:20 2019
leaf03(P)      leaf04        44:38:39:ff:ff:02  up      up    12    12    Thu Feb  7
18:31:26 2019
leaf04        leaf03(P)      44:38:39:ff:ff:02  up      up    12    12    Thu Feb  7
18:31:30 2019
```

When you are logged directly into a switch, you can run `clagctl` to get the state:

```
cumulus@switch:/var/log# sudo clagctl

The peer is alive
Peer Priority, ID, and Role: 4096 00:02:00:00:00:4e primary
Our Priority, ID, and Role: 8192 44:38:39:00:a5:38 secondary
Peer Interface and IP: peerlink-3.4094 169.254.0.9
VxLAN Anycast IP: 36.0.0.20
Backup IP: 27.0.0.20 (active)
System MAC: 44:38:39:ff:ff:01

CLAG Interfaces
Our Interface    Peer Interface   CLAG Id Conflicts          Proto-Down Reason
---------------- ---------------- ------- ------------------- -----------------
vx-38          vx-38          -      -                -
vx-33          vx-33          -      -                -
hostbond4       hostbond4       1      -                -
hostbond5       -              2      -                -
vx-37          vx-37          -      -                -
```

```
vx-36        vx-36        -    -          -
vx-35        vx-35        -    -          -
vx-34        vx-34        -    -          -
```

## Scenario: VXLAN Active-active Device or Interface Is Down

When a VXLAN active-active device or interface in an MLAG configuration is down, log messages also include VXLAN and LNV checks.

```
2017-05-22T23:16:51.517522+00:00 noc-pr netq-notifier[5501]: WARNING: VXLAN: 2 node(s) have failures. They are: spine01, leaf01
2017-05-22T23:16:51.525403+00:00 noc-pr netq-notifier[5501]: WARNING: LINK: 2 link(s) are down. They are: leaf01 vx-37, spine01 vx-37
2017-05-22T23:16:54.194681+00:00 noc-pr netq-notifier[5501]: WARNING: LNV: 1 node(s) have failures. They are: leaf02
2017-05-22T23:16:59.448755+00:00 noc-pr netq-notifier[5501]: WARNING: LNV: 3 node(s) have failures. They are: leaf01, leaf03, leaf04
2017-05-22T23:17:04.703044+00:00 noc-pr netq-notifier[5501]: WARNING: CLAG: 2 node(s) have failures. They are: spine01, leaf01
```

To begin your investigation, show the status of the `clagd` service:

```
cumulus@switch:~$ netq spine01 show services clagd

Matching services records:
Hostname         Service            PID   VRF           Enabled Active Monitored
```

```
Status        Uptime              Last Changed
---------------- ------------------- ----- -------------- ------- ------ --------- ----------------
------------------------ ------------------------
spine01        clagd            2678  default      yes    yes   yes     error        23h:
57m:16s           Thu Feb  7 18:30:49 2019
```

Checking the MLAG status provides the reason for the failure:

```
cumulus@switch:~$ netq check clag
Checked Nodes: 6, Warning Nodes: 2, Failed Nodes: 2
Node          Reason
--------------- --------------------------------------------------------------------------
spine01         Protodown Bonds: vx-37:vxlan-single
leaf01         Protodown Bonds: vx-37:vxlan-single
```

You can retrieve the output in JSON format for export to another tool:

```
cumulus@switch:~$ netq check clag json
{
   "failedNodes": [
      {
         "node": "spine01",
         "reason": "Protodown Bonds: vx-37:vxlan-single"
      }
      ,
      {
```

```
            "node": "leaf01",
            "reason": "Protodown Bonds: vx-37:vxlan-single"
        }
    ],
    "summary":{
            "checkedNodeCount": 6,
            "failedNodeCount": 2,
            "warningNodeCount": 2
    }
}
```


After you fix the issue, you can show the MLAG state to see if all the nodes are up:

```
cumulus@switch:~$ netq show clag
Matching clag session records are:
Hostname         Peer             SysMac            State      Backup #Bond #Dual Last
Changed
                                                                      s
---------------- ---------------- ----------------- ---------- ------ ----- ----- ------------------------
spine01(P)       spine02          00:01:01:10:00:01  up        up     24    24    Thu Feb  7
18:30:49 2019
spine02          spine01(P)       00:01:01:10:00:01  up        up     24    24    Thu Feb  7
18:30:53 2019
leaf01(P)        leaf02           44:38:39:ff:ff:01  up        up     12    12    Thu Feb  7
18:31:15 2019
leaf02           leaf01(P)        44:38:39:ff:ff:01  up        up     12    12    Thu Feb  7
18:31:20 2019
leaf03(P)        leaf04           44:38:39:ff:ff:02  up        up     12    12    Thu Feb  7
```

```
18:31:26 2019
leaf04         leaf03(P)       44:38:39:ff:ff:02  up        up     12    12    Thu Feb  7
18:31:30 2019
```

When you are logged directly into a switch, you can run `clagctl` to get the state:

```
cumulus@switch:/var/log# sudo clagctl

The peer is alive
Peer Priority, ID, and Role: 4096 00:02:00:00:00:4e primary
Our Priority, ID, and Role: 8192 44:38:39:00:a5:38 secondary
Peer Interface and IP: peerlink-3.4094 169.254.0.9
VxLAN Anycast IP: 36.0.0.20
Backup IP: 27.0.0.20 (active)
System MAC: 44:38:39:ff:ff:01

CLAG Interfaces
Our Interface    Peer Interface   CLAG Id Conflicts          Proto-Down Reason
---------------- ---------------- ------- ------------------- -----------------
vx-38          vx-38          -      -                -
vx-33          vx-33          -      -                -
hostbond4       hostbond4       1      -                -
hostbond5       hostbond5       2      -                -
vx-37          -              -      -                vxlan-single
vx-36          vx-36          -      -                -
vx-35          vx-35          -      -                -
vx-34          vx-34          -      -                -
```

## Scenario: Remote-side clagd Stopped by systemctl Command

In the event the `clagd` service is stopped via the `systemctl` command, NetQ Notifier sends messages similar to the following:

```
2017-05-22T23:51:19.539033+00:00 noc-pr netq-notifier[5501]: WARNING: VXLAN: 1 node(s) have failures. They are: leaf01
2017-05-22T23:51:19.622379+00:00 noc-pr netq-notifier[5501]: WARNING: LINK: 2 link(s) flapped and are down. They are: leaf01 hostbond5, leaf01 hostbond4
2017-05-22T23:51:19.622922+00:00 noc-pr netq-notifier[5501]: WARNING: LINK: 23 link(s) are down. They are: leaf01 VlanA-1-104-v0, leaf01 VlanA-1-101-v0, leaf01 VlanA-1, leaf01 vx-33, leaf01 vx-36, leaf01 vx-37, leaf01 vx-34, leaf01 vx-35, leaf01 swp7, leaf01 VlanA-1-102-v0, leaf01 VlanA-1-103-v0, leaf01 VlanA-1-100-v0, leaf01 VlanA-1-106-v0, leaf01 swp8, leaf01 VlanA-1.106, leaf01 VlanA-1.105, leaf01 VlanA-1.104, leaf01 VlanA-1.103, leaf01 VlanA-1.102, leaf01 VlanA-1.101, leaf01 VlanA-1.100, leaf01 VlanA-1-105-v0, leaf01 vx-38
2017-05-22T23:51:27.696572+00:00 noc-pr netq-notifier[5501]: INFO: LINK: 15 link(s) are up. They are: leaf01 VlanA-1.106, leaf01 VlanA-1-104-v0, leaf01 VlanA-1.104, leaf01 VlanA-1.103, leaf01 VlanA-1.101, leaf01 VlanA-1-100-v0, leaf01 VlanA-1.100, leaf01 VlanA-1.102, leaf01 VlanA-1-101-v0, leaf01 VlanA-1-102-v0, leaf01 VlanA-1.105, leaf01 VlanA-1-103-v0, leaf01 VlanA-1-106-v0, leaf01 VlanA-1, leaf01 VlanA-1-105-v0
2017-05-22T23:51:30.863789+00:00 noc-pr netq-notifier[5501]: WARNING: LNV: 1 node(s) have failures. They are: leaf01
2017-05-22T23:51:36.156708+00:00 noc-pr netq-notifier[5501]: WARNING: CLAG: 2 node(s) have failures. They are: spine01, leaf01
2017-05-22T23:51:36.183638+00:00 noc-pr netq-notifier[5501]: WARNING: LNV: 2 node(s) have failures. They are: spine02, leaf01
```

```
2017-05-22T23:51:41.444670+00:00 noc-pr netq-notifier[5501]: WARNING: LNV: 1
node(s) have failures. They are: leaf01
```

Showing the MLAG state reveals which nodes are down:

```
cumulus@switch:~$ netq show clag
Matching CLAG session records are:
Node             Peer             SysMac            State Backup #Bonds #Dual Last Changed
---------------- ---------------- ----------------- ----- ------ ------ ----- -------------------------
spine01(P)       spine02          00:01:01:10:00:01 up    up     9      9     Thu Feb  7
18:30:53 2019
spine02          spine01(P)       00:01:01:10:00:01 up    up     9      9     Thu Feb  7
18:31:04 2019
leaf01                            44:38:39:ff:ff:01 down  n/a    0      0     Thu Feb  7 18:31:13
2019
leaf03(P)        leaf04           44:38:39:ff:ff:02 up    up     8      8     Thu Feb  7 18:31:19
2019
leaf04           leaf03(P)        44:38:39:ff:ff:02 up    up     8      8     Thu Feb  7 18:31:25
2019
```

Checking the MLAG status provides the reason for the failure:

```
cumulus@switch:~$ netq check clag
Checked Nodes: 6, Warning Nodes: 1, Failed Nodes: 2
Node             Reason
---------------- --------------------------------------------------------------------------
```

```
spine01        Peer Connectivity failed
leaf01         Peer Connectivity failed
```

You can retrieve the output in JSON format for export to another tool:

```
cumulus@switch:~$ netq check clag json
{
    "failedNodes": [
        {
            "node": "spine01",
            "reason": "Peer Connectivity failed"
        }
        ,
        {
            "node": "leaf01",
            "reason": "Peer Connectivity failed"
        }
    ],
    "summary":{
        "checkedNodeCount": 6,
        "failedNodeCount": 2,
        "warningNodeCount": 1
    }
}
```

When you are logged directly into a switch, you can run `clagctl` to get the state:

```
cumulus@switch:~$ sudo clagctl

The peer is not alive
Our Priority, ID, and Role: 8192 44:38:39:00:a5:38 primary
Peer Interface and IP: peerlink-3.4094 169.254.0.9
VxLAN Anycast IP: 36.0.0.20
Backup IP: 27.0.0.20 (inactive)
System MAC: 44:38:39:ff:ff:01

CLAG Interfaces
Our Interface    Peer Interface   CLAG Id Conflicts          Proto-Down Reason
---------------- ---------------- ------- -------------------- -----------------
vx-38          -             -      -               -
vx-33          -             -      -               -
hostbond4       -             1      -               -
hostbond5       -             2      -               -
vx-37          -             -      -               -
vx-36          -             -      -               -
vx-35          -             -      -               -
vx-34          -             -      -               -
```

# CLI Early Access Features

NetQ has early access features that provide advanced access to new functionality before it becomes generally available. Two features are available as early access features in NetQ 2.3.0:

- Detailed `netq check` validation output
- View MAC address history, `netq show mac-history' here

These features are bundled into the `netq-apps` package; there is no specific EA package like there typically is with Cumulus Linux.

These features are provided as is, and are subject to change before they become generally available.

## Enable/Disable Early Access Features

You enable early access features by running the `netq config add experimental` command on any node running NetQ.

```
cumulus@switch:~$ netq config add experimental
Experimental config added
```

You disable the early access features by running the `netq config del experimental` command on any node running NetQ.

```
cumulus@switch:~$ netq config del experimental
Experimental config deleted
```

## Validation Commands

When you enable the experimental commands, you are able to access the updated validation command options. Two key differences are present with these updated commands:

- You can view more detail about the validation tests that are run with each command
- You can filter these tests to run only those tests of interest

The following options are added to the syntax of the `netq check` commands:

```
netq check agents [around <text-time>] [json]
netq check bgp [vrf <vrf>] [include <bgp-number-range-list> | exclude <bgp-number-range-list>] [around <text-time>] [json]
netq check clag [include <clag-number-range-list> | exclude <clag-number-range-list>] [around <text-time>] [json]
netq check evpn [mac-consistency] [include <evpn-number-range-list> | exclude <evpn-number-range-list>] [around <text-time>] [json]
netq check interfaces [include <interface-number-range-list> | exclude <interface-number-range-list>] [around <text-time>] [json]
netq check license [include <license-number-range-list> | exclude <license-number-range-list>] [around <text-time>] [json]
netq check lnv [around <text-time>] [json]
netq check mtu [unverified] [include <mtu-number-range-list> | exclude <mtu-number-range-list>] [around <text-time>] [json]
```

```
netq check ntp [include <ntp-number-range-list> | exclude <ntp-number-range-list>] [around <text-time>] [json]
netq check ospf [include <ospf-number-range-list> | exclude <ospf-number-range-list>] [around <text-time>] [json]
netq check sensors [include <sensors-number-range-list> | exclude <sensors-number-range-list>] [around <text-time>] [json]
netq check vlan [unverified] [include <vlan-number-range-list> | exclude <vlan-number-range-list>] [around <text-time>] [json]
netq check vxlan [include <vxlan-number-range-list> | exclude <vxlan-number-range-list>] [around <text-time>] [json]
```

Each of the check commands provides a starting point for troubleshooting configuration and connectivity issues within your network in real time.

A summary of the validation results is achieved by running the `netq check` commands without any options; for example, `netq check agents` or `netq check evpn`. This summary displays such data as the total number of nodes checked, how many failed a test, total number of sessions checked, how many of these that failed, and so forth.

With the NetQ 2.3.0 release, you have can view more information about the individual tests that are run as part of the validation, with the exception of agents and LNV.

You can run validations for a time in the past and output the results in JSON format if desired. The `around` option enables users to view the network state at an earlier time. The `around` option value requires an integer *plus* a unit of measure (UOM), with no space between them. The following are valid UOMs:

| UOM | Command Value | Example |
|---|---|---|
| day(s) | <#>d | 3d |

| UOM | Command Value | Example |
|---|---|---|
| hour(s) | <#>h | 6h |
| minute(s) | <#>m | 30m |
| second(s) | <#>s | 20s |

TIP

If you want to go back in time by months or years, use the equivalent number of days.

For validation commands that have the `include <protocol-number-range-list>` and `exclude <protocol-number-range-list>` options, you can include or exclude one or more of the various tests performed during the validation. Each test is assigned a number, which is used to identify which tests to run. By default, all tests are run. The value of `<protocol-number-range-list>` is a number list separated by commas, or a range using a dash, or a combination of these. Do not use spaces after commas. For example:

- include 1,3,5
- include 1-5
- include 1,3-5
- exclude 6,7
- exclude 6-7
- exclude 3,4-7,9

The output indicates whether a given test passed, failed, or was skipped.

TIP

Output from the netq check commands are color-coded; green for successful results and red for failures, warnings, and errors. Use the netq config add color command to enable the use of color.

### What the NetQ Validation System Checks

Each of the netq check commands perform a set of validation tests appropriate to the protocol or element being validated.

To view the list of tests run for a given protocol or service, use either netq show <protocol/service> unit-tests or perform a tab completion on netq check <protocol/service> [include|exclude].

This section describes these tests.

### NetQ Agent Validation Tests

The netq check agents command looks for an agent status of Rotten for each node in the network. A *Fresh* status indicates the Agent is running as expected. The Agent sends a heartbeat every 30 seconds, and if three consecutive heartbeats are missed, its status changes to *Rotten*.

### BGP Validation Tests

The netq check bgp command runs the following tests to establish session sanity:

| Test Number | Test Name | Description |
| --- | --- | --- |
| 0 | Session Establishment | Checks that BGP sessions are in an established state |

| Test Number | Test Name | Description |
|---|---|---|
| 1 | Address Families | Checks if transmit and receive address family advertisement is consistent between peers of a BGP session |
| 2 | Router ID | Checks for BGP router ID conflict in the network |

CLAG Validation Tests

The `netq check clag` command runs the following tests:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | Peering | Checks if:<br>• CLAG peerlink is up<br>• CLAG peerlink bond slaves are down (not in full capacity and redundancy)<br>• Peering is established between two nodes in a CLAG pair |
| 1 | Backup IP | Checks if:<br>• CLAG backup IP configuration is missing on a CLAG node<br>• CLAG backup IP is correctly pointing to the CLAG peer and its connectivity is available |

| Test Number | Test Name | Description |
|---|---|---|
| 2 | Clag Sysmac | Checks if:<br>• CLAG Sysmac is consistently configured on both nodes in a CLAG pair<br>• there is any duplication of a CLAG sysmac within a bridge domain |
| 3 | VXLAN Anycast IP | Checks if the VXLAN anycast IP address is consistently configured on both nodes in a CLAG pair |
| 4 | Bridge Membership | Checks if the CLAG peerlink is part of bridge |
| 5 | Spanning Tree | Checks if:<br>• STP is enabled and running on the CLAG nodes<br>• CLAG peerlink role is correct from STP perspective<br>• the bridge ID is consistent between two nodes of a CLAG pair<br>• the VNI in the bridge has BPDU guard and BPDU filter enabled |
| 6 | Dual Home | Checks for:<br>• CLAG bonds that are not in dually connected state<br>• dually connected bonds have consistent VLAN and MTU configuration on both sides<br>• STP has consistent view of bonds' dual connectedness |

| Test Number | Test Name | Description |
|---|---|---|
| 7 | Single Home | Checks for:<br>• singly connected bonds<br>• STP has consistent view of bond's single connectedness |
| 8 | Conflicted Bonds | Checks for bonds in CLAG conflicted state and shows the reason |
| 9 | ProtoDown Bonds | Checks for bonds in protodown state and shows the reason |
| 10 | SVI | Checks if:<br>• an SVI is configured on both sides of a CLAG pair<br>• SVI on both sides have consistent MTU setting |

Cumulus Linux Version Tests

The `netq check cl-version` command runs the following tests:

| Test Number | Test Name | Description |
| --- | --- | --- |
| 0 | Cumulus Linux Image Version | Checks the following:<br>• no version specified, checks that all switches in the network have consistent version<br>• *match-version* specified, checks that a switch's OS version is equals the specified version<br>• *min-version* specified, checks that a switch's OS version is equal to or greater than the specified version |

EVPN Validation Tests

The `netq check evpn` command runs the following tests to establish session sanity:

| Test Number | Test Name | Description |
| --- | --- | --- |
| 0 | EVPN BGP Session | Checks if:<br>• BGP EVPN sessions are established<br>• the EVPN address family advertisement is consistent |
| 1 | EVPN VNI Type Consistency | Because a VNI can be of type L2 or L3, checks that for a given VNI, its type is consistent across the network |
| 2 | EVPN Type 2 | Checks for consistency of IP-MAC binding and the location of a given IP-MAC across all VTEPs |
| 3 | EVPN Type 3 | Checks for consistency of replication group across all VTEPs |

| Test Number | Test Name | Description |
|---|---|---|
| 4 | EVPN Session | For each EVPN session, checks if:<br>• *adv_all_vni* is enabled<br>• FDB learning is disabled on tunnel interface |
| 5 | Vlan Consistency | Checks for consistency of VLAN to VNI mapping across the network |
| 6 | Vrf Consistency | Checks for consistency of VRF to L3 VNI mapping across the network |

Interface Validation Tests

The `netq check interfaces` command runs the following tests:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | Admin State | Checks for consistency of administrative state on two sides of a physical interface |
| 1 | Oper State | Checks for consistency of operational state on two sides of a physical interface |
| 2 | Speed | Checks for consistency of the speed setting on two sides of a physical interface |
| 3 | Autoneg | Checks for consistency of the auto-negotiation setting on two sides of a physical interface |

License Validation Tests

The `netq check license` command runs the following test:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | License Validity | Checks for validity of license on all switches |

LNV Validation Tests

The `netq check lnv` command checks for VXRD peer database, VXSND peer database, VNI operational state and head end replication list consistency.

Link MTU Validation Tests

The `netq check mtu` command runs the following tests:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | Link MTU Consistency | Checks for consistency of MTU setting on two sides of a physical interface |
| 1 | VLAN interface | Checks if the MTU of an SVI is no smaller than the parent interface, substracting the VLAN tag size |
| 2 | Bridge interface | Checks if the MTU on a bridge is not arbitrarily smaller than the smallest MTU among its members |

NTP Validation Tests

The `netq check ntp` command runs the following test:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | NTP Sync | Checks if the NTP service is running and in sync state |

### OSPF Validation Tests

The `netq check ospf` command runs the following tests to establish session sanity:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | Router ID | Checks for OSPF router ID conflicts in the network |
| 1 | Adjacency | Checks or OSPF adjacencies in a down or unknown state |
| 2 | Timers | Checks for consistency of OSPF timer values in an OSPF adjacency |
| 3 | Network Type | Checks for consistency of network type configuration in an OSPF adjacency |
| 4 | Area ID | Checks for consistency of area ID configuration in an OSPF adjacency |
| 5 | Interface MTU | Checks for MTU consistency in an OSPF adjacency |
| 6 | Service Status | Checks for OSPF service health in an OSPF adjacency |

### Sensor Validation Tests

The `netq check sensors` command runs the following tests:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | PSU sensors | Checks for power supply unit sensors that are not in ok state |
| 1 | Fan sensors | Checks for fan sensors that are not in ok state |

| Test Number | Test Name | Description |
|---|---|---|
| 2 | Temperature sensors | Checks for temperature sensors that are not in ok state |

VLAN Validation Tests

The `netq check vlan` command runs the following tests:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | Link Neighbor VLAN Consistency | Checks for consistency of VLAN configuration on two sides of a port or a bond |
| 1 | CLAG Bond VLAN Consistency | Checks for consistent VLAN membership of a CLAG bond on each side of the CLAG pair |

VXLAN Validation Tests

The `netq check vxlan` command runs the following tests:

| Test Number | Test Name | Description |
|---|---|---|
| 0 | VLAN Consistency | Checks for consistent VLAN to VXLAN mapping across all VTEPs |
| 1 | BUM replication | Checks for consistent replication group membership across all VTEPs |

## Validation Examples

This section provides validation examples for a variety of protocols and elements.

### Perform a NetQ Agent Validation

The default validation confirms that the NetQ Agent is running on all monitored nodes and provides a summary of the validation results. This example shows the results of a fully successful validation.

```
cumulus@switch:~$ netq check agents
Checked nodes: 12, Rotten nodes: 0
```

This example shows representative results when one or more of the NetQ Agents do not pass the validation check.

```
cumulus@switch:~$ netq check agents
Checked nodes: 25, Rotten nodes: 1
Hostname          Status           Last Changed
----------------- ---------------- -------------------------
leaf01            Rotten           8d:13h:34m:51s
```

### Perform a BGP Validation

The default validation runs a network-wide BGP connectivity and configuration check on all nodes running the BGP service:

```
cumulus@switch:~$ netq check bgp
Total Nodes: 15, Failed Nodes: 0, Total Sessions: 16, Failed Sessions: 0
```

This example indicates that all nodes running BGP and all BGP sessions are running properly. If there were issues with any of the nodes, NetQ would provide information about each node to aid in resolving the issues.

### Perform a BGP Validation for a Particular VRF

Using the `vrf <vrf>` option of the `netq check bgp` command, you can validate the BGP service where communication is occurring through a particular virtual route. In this example, the VRF of interest is named *DataVrf1081*.

```
cumulus@switch:~$ netq check bgp vrf DataVrf1081
Total Nodes: 25, Failed Nodes: 1, Total Sessions: 52 , Failed Sessions: 1
Hostname          VRF             Peer Name         Peer Hostname
Reason                                        Last Changed
----------------- --------------- ----------------- ----------------- --------------------------------------------
-------------------------
exit-1            DataVrf1081     swp7.3            firewall-2        BGP session with peer
firewall-2 (swp7.3 vrf  1d:5h:47m:31s
                                                          DataVrf1081) failed,
                                                          reason: Peer not configured
```

### Perform a BGP Validation with Selected Tests

Using the `include <bgp-number-range-list>` and `exclude <bgp-number-range-list>` options, you can include or exclude one or more of the various checks performed during the validation. You can select from the following BGP validation tests:

| Test Number | Test Name |
|---|---|
| 0 | Session Establishment |

| Test Number | Test Name |
|---|---|
| 1 | Address Families |
| 2 | Router ID |

Refer to BGP Validation Tests for a description of these tests.

To include only the session establishment and router ID tests during a validation, run either of these commands:

```
cumulus@switch:~$ netq check bgp include 0,2

cumulus@switch:~$ netq check bgp exclude 1
```

Either way, a successful validation output would be similar to the following:

```
bgp check result summary:

Checked nodes       : 8
Total nodes         : 8
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
Total Sessions      : 30
Failed Sessions     : 0

Session Establishment Test   : passed,
```

```
Address Families Test       : skipped
Router ID Test              : passed,
```

### Perform a BGP Validation and Output Results to JSON File

This example shows the default BGP validation results as it appears in a JSON file.

```
cumulus@switch:~$ netq check bgp json
{
    "tests":{
        "Session Establishment":{
            "errors":[
                {
                    "hostname":"exit-1",
                    "error":{
                        "peerHostname":"firewall-2",
                        "lastChanged":"Tue Jun 11 00:00:26 2019",
                        "hostname":"exit-1",
                        "peerName":"swp7.3",
                        "reason":"BGP session with peer firewall-2 (swp7.3 vrf DataVrf1081)
failed, reason: Peer not configured",
                        "vrf":"DataVrf1081"
                    }
                },
                . . .
            ],
            "enabled":true,
            "passed":false,
            "warnings":[
```

```
        ]
      },
      "Address Families":{
        "errors":[
          {
            "hostname":"exit-1",
            "error":{
              "peerHostname":"firewall-1",
              "lastChanged":"Sat Jun  1 03:34:10 2019",
              "hostname":"exit-1",
              "peerName":"swp6.3",
              "reason":"BGP session with peer firewall-1 swp6.3: AFI/SAFI evpn not activated on peer",
              "vrf":"DataVrf1081"
            }
          },
          . . .
        ],
        "enabled":true,
        "passed":false,
        "warnings":[

        ]
      },
      "Router ID":{
        "errors":[

        ],
```

```
        "enabled":true,
        "passed":true,
        "warnings":[

        ]
      }
    },
    "failed_node_set":[
      "exit-1",
      "torc-12",
      "spine-1",
      "spine-3",
      "spine-2",
      "torc-21",
      "firewall-1"
    ],
    "summary":{
      "total_cnt":14,
      "rotten_node_cnt":5,
      "failed_node_cnt":7,
      "warn_node_cnt":0,
      "checked_cnt":9,
      "total_sessions":174,
      "failed_sessions":42
    },
    "rotten_node_set":[
      "exit-2",
      "torc-22",
      "hostd-11",
```

```
        "torc-11",
        "firewall-2"
    ],
    "warn_node_set":[

    ],
    "validation":"BGP"
}
```

### Perform a CLAG Validation

The default validation runs a network-wide CLAG connectivity and configuration check on all nodes running the CLAD service. This example shows results for a fully successful validation.

```
cumulus@switch:~$ netq check clag
clag check result summary:

Checked nodes       : 4
Total nodes         : 4
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Peering Test             : passed,
Backup IP Test           : passed,
Clag SysMac Test         : passed,
VXLAN Anycast IP Test    : passed,
Bridge Membership Test   : passed,
```

```
Spanning Tree Test       : passed,
Dual Home Test           : passed,
Single Home Test         : passed,
Conflicted Bonds Test    : passed,
ProtoDown Bonds Test     : passed,
SVI Test                 : passed,
```

This example shows representative results for one or more failures, warnings, or errors. In particular, you can see that you have duplicate system MAC addresses.

```
cumulus@switch:~$ netq check clag
clag check result summary:

Checked nodes       : 4
Total nodes         : 4
Rotten nodes        : 0
Failed nodes        : 2
Warning nodes       : 0

Peering Test             : passed,
Backup IP Test           : passed,
Clag SysMac Test         : 0 warnings, 2 errors,
VXLAN Anycast IP Test    : passed,
Bridge Membership Test   : passed,
Spanning Tree Test       : passed,
Dual Home Test           : passed,
Single Home Test         : passed,
Conflicted Bonds Test    : passed,
```

```
ProtoDown Bonds Test     : passed,
SVI Test                 : passed,

Clag SysMac Test details:
Hostname         Reason
---------------- --------------------------------------------
leaf01           Duplicate sysmac with leaf02/None
leaf03           Duplicate sysmac with leaf04/None
```

### Perform a CLAG Validation with Selected Tests

Using the `include <clag-number-range-list>` and `exclude <clag-number-range-list>` options, you can include or exclude one or more of the various checks performed during the validation. You can select from the following CLAG validation tests:

| Test Number | Test Name |
| --- | --- |
| 0 | Peering |
| 1 | Backup IP |
| 2 | Clag Sysmac |
| 3 | VXLAN Anycast IP |
| 4 | Bridge Membership |
| 5 | Spanning Tree |
| 6 | Dual Home |
| 7 | Single Home |
| 8 | Conflicted Bonds |
| 9 | ProtoDown Bonds |

| Test Number | Test Name |
|---|---|
| 10 | SVI |

Refer to CLAG Validation Tests for descriptions of these tests.

To include only the CLAG SysMAC test during a validation:

```
cumulus@switch:~$ netq check clag include 2
clag check result summary:

Checked nodes       : 4
Total nodes         : 4
Rotten nodes        : 0
Failed nodes        : 2
Warning nodes       : 0

Peering Test             : skipped
Backup IP Test           : skipped
Clag SysMac Test         : 0 warnings, 2 errors,
VXLAN Anycast IP Test    : skipped
Bridge Membership Test   : skipped
Spanning Tree Test       : skipped
Dual Home Test           : skipped
Single Home Test         : skipped
Conflicted Bonds Test    : skipped
ProtoDown Bonds Test     : skipped
SVI Test                 : skipped

Clag SysMac Test details:
```

```
Hostname          Reason
----------------- ---------------------------------------------
leaf01            Duplicate sysmac with leaf02/None
leaf03            Duplicate sysmac with leaf04/None
```

To exclude the backup IP, CLAG SysMAC, and VXLAN anycast IP tests during a validation:

```
cumulus@switch:~$ netq check clag exclude 1-3
clag check result summary:

Checked nodes       : 4
Total nodes         : 4
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Peering Test             : passed,
Backup IP Test           : skipped
Clag SysMac Test         : skipped
VXLAN Anycast IP Test    : skipped
Bridge Membership Test   : passed,
Spanning Tree Test       : passed,
Dual Home Test           : passed,
Single Home Test         : passed,
Conflicted Bonds Test    : passed,
ProtoDown Bonds Test     : passed,
SVI Test                 : passed,
```

### Perform a Cumulus Linux Version Validation

The default validation (using no options) checks that all switches in the network have a consistent version.

```
cumulus@switch:/$ netq check cl-version
version check result summary:

Checked nodes       : 12
Total nodes         : 12
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0



Cumulus Linux Image Version Test   : passed
```

### Perform an EVPN Validation

The default validation runs a network-wide EVPN connectivity and configuration check on all nodes running the EVPN service. This example shows results for a fully successful validation.

```
cumulus@switch:~$ netq check evpn
evpn check result summary:

Checked nodes       : 6
Total nodes         : 6
Rotten nodes        : 0
```

```
Failed nodes       : 0
Warning nodes      : 0

Additional summary:
Failed BGP Sessions : 0
Total Sessions     : 16
Total VNIs         : 3

EVPN BGP Session Test          : passed,
EVPN VNI Type Consistency Test  : passed,
EVPN Type 2 Test               : passed,
EVPN Type 3 Test               : passed,
EVPN Session Test              : passed,
Vlan Consistency Test          : passed,
Vrf Consistency Test           : passed,
```

### Perform an EVPN MAC Consistency Validation

Using the `mac-consistency` option, you can view any inconsistencies in the usage of MAC addresses in the EVPN overlay network.

> IMPORTANT
>
> The NetQ 2.3.x release is the last release that will support the `mac-consistency` option. However, this is equivalent to running only the EVPN Type 2 validation test. Refer to Perform an EVPN Validation with Selected Tests for details. As of Cumulus NetQ 2.4, the `mac-consistency` option will be removed.

```
cumulus@oob-mgmt-server:~$ netq check evpn mac-consistency
evpn check result summary:

Checked nodes       : 6
Total nodes         : 6
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
Failed BGP Sessions : 0
Total Sessions      : 16
Total VNIs          : 3

EVPN BGP Session Test            : passed,
EVPN VNI Type Consistency Test   : passed,
EVPN Type 2 Test                 : passed,
EVPN Type 3 Test                 : passed,
EVPN Session Test                : passed,
Vlan Consistency Test            : passed,
Vrf Consistency Test             : passed,
```

### Perform an EVPN Validation for a Time in the Past

Using the `around` option, you can view the state of the EVPN service at a time in the past. Be sure to include the UOM.

```
cumulus@oob-mgmt-server:~$ netq check evpn around 4d
evpn check result summary:

Checked nodes       : 6
Total nodes         : 6
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
Failed BGP Sessions : 0
Total Sessions      : 16
Total VNIs          : 3

EVPN BGP Session Test            : passed,
EVPN VNI Type Consistency Test   : passed,
EVPN Type 2 Test                 : passed,
EVPN Type 3 Test                 : passed,
EVPN Session Test                : passed,
Vlan Consistency Test            : passed,
Vrf Consistency Test             : passed,
```

### Perform an EVPN Validation with Selected Tests

Using the `include <evpn-number-range-list>` and `exclude <evpn-number-range-list>` options, you can include or exclude one or more of the various checks performed during the validation. You can select from the following EVPN validation tests:

| Test Number | Test Name |
|---|---|
| 0 | EVPN BGP Session |
| 1 | EVPN VNI Type Consistency |
| 2 | EVPN Type 2 |
| 3 | EVPN Type 3 |
| 4 | EVPN Session |
| 5 | Vlan Consistency |
| 6 | Vrf Consistency |

Refer to EVPN Validation Tests for descriptions of these tests.

To run only the EVPN Type 2 test:

```
cumulus@switch:~$ netq check evpn include 2
evpn check result summary:

Checked nodes       : 6
Total nodes         : 6
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
Failed BGP Sessions : 0
Total Sessions      : 0
Total VNIs          : 3
```

```
EVPN BGP Session Test          : skipped
EVPN VNI Type Consistency Test  : skipped
EVPN Type 2 Test               : passed,
EVPN Type 3 Test               : skipped
EVPN Session Test              : skipped
Vlan Consistency Test          : skipped
Vrf Consistency Test           : skipped
```

To exclude the BGP session and VRF consistency tests:

```
cumulus@switch:~$ netq check evpn exclude 0,6
evpn check result summary:

Checked nodes       : 6
Total nodes         : 6
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
Failed BGP Sessions : 0
Total Sessions      : 0
Total VNIs          : 3


EVPN BGP Session Test          : skipped
EVPN VNI Type Consistency Test  : passed,
```

```
EVPN Type 2 Test              : passed,
EVPN Type 3 Test              : passed,
EVPN Session Test             : passed,
Vlan Consistency Test         : passed,
Vrf Consistency Test          : skipped
```

To run only the first five tests:

```
cumulus@switch:~$ netq check evpn include 0-4
evpn check result summary:

Checked nodes       : 6
Total nodes         : 6
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
Failed BGP Sessions : 0
Total Sessions      : 16
Total VNIs          : 3



EVPN BGP Session Test            : passed,
EVPN VNI Type Consistency Test   : passed,
EVPN Type 2 Test                 : passed,
EVPN Type 3 Test                 : passed,
EVPN Session Test                : passed,
```

```
Vlan Consistency Test        : skipped
Vrf Consistency Test         : skipped
```

### Perform an Interfaces Validation

The default validation runs a network-wide connectivity and configuration check on all interfaces. This example shows results for a fully successful validation.

```
cumulus@switch:~$ netq check interfaces
interface check result summary:

Checked nodes      : 12
Total nodes        : 12
Rotten nodes       : 0
Failed nodes       : 0
Warning nodes      : 0

Additional summary:
Unverified Ports   : 56
Checked Ports      : 108
Failed Ports       : 0

Admin State Test   : passed,
Oper State Test    : passed,
Speed Test         : passed,
Autoneg Test       : passed,
```

### Perform an Interfaces Validation for a Time in the Past

Using the `around` option, you can view the state of the interfaces at a time in the past. Be sure to include the UOM.

```
cumulus@oob-mgmt-server:~$ netq check interfaces around 6h
interface check result summary:

Checked nodes       : 12
Total nodes         : 12
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
Unverified Ports    : 56
Checked Ports       : 108
Failed Ports        : 0


Admin State Test    : passed,
Oper State Test     : passed,
Speed Test          : passed,
Autoneg Test        : passed,
```

### Perform an Interfaces Validation with Selected Tests

Using the `include <interface-number-range-list>` and `exclude <interface-number-range-list>` options, you can include or exclude one or more of the various checks performed during the validation. You can select from the following interface validation tests:

| Test Number | Test Name |
|---|---|
| 0 | Admin State |
| 1 | Oper State |
| 2 | Speed |
| 3 | Autoneg |

Refer to Interface Validation Tests for descriptions of these tests.

### Perform a License Validation

You can also check for any nodes that have invalid licenses without going to each node. Because switches do not operate correctly without a valid license you might want to verify that your Cumulus Linux licenses on a regular basis.

This example shows that all licenses on switches are valid.

```
cumulus@oob-mgmt-server:~$ netq check license
license check result summary:

Checked nodes       : 12
Total nodes         : 12
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0
```

```
Additional summary:
Checked Licenses    : 8
Failed Licenses     : 0

License validity Test   : passed,
```

TIP

This command checks every node, meaning every switch and host in the network. Hosts do not require a Cumulus Linux license, so the number of licenses checked might be smaller than the total number of nodes checked.

### Perform a Link MTU Validation

The default validate verifies that all corresponding interface links have matching MTUs. This example shows no mismatches.

```
cumulus@switch:~$ netq check mtu
mtu check result summary:

Checked nodes       : 12
Total nodes         : 12
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
```

```
Warn Links         : 0
Failed Links       : 0
Checked Links      : 196

Link MTU Consistency Test   : passed,
VLAN interface Test         : passed,
Bridge interface Test       : passed,
```

### Perform an NTP Validation

The default validation checks for synchronization of the NTP server with all nodes in the network. It is always important to have your devices in time synchronization to ensure configuration and management events can be tracked and correlations can be made between events.

This example shows that server04 has an error.

```
cumulus@switch:~$ netq check ntp
ntp check result summary:

Checked nodes      : 12
Total nodes        : 12
Rotten nodes       : 0
Failed nodes       : 1
Warning nodes      : 0

Additional summary:
Unknown nodes      : 0
NTP Servers        : 3
```

```
NTP Sync Test   : 0 warnings, 1 errors,

NTP Sync Test details:
Hostname         NTP Sync Connect Time
---------------- -------- -------------------------
server04         no       2019-09-17 19:21:47
```

### Perform an OSPF Validation

The default validation runs a network-wide OSPF connectivity and configuration check on all nodes running the OSPF service. This example shows results several errors in the Timers and Interface MTU tests.

```
cumulus@switch:~# netq check ospf
Checked nodes: 8, Total nodes: 8, Rotten nodes: 0, Failed nodes: 4, Warning
nodes: 0, Failed Adjacencies: 4, Total Adjacencies: 24

Router ID Test        : passed
Adjacency Test        : passed
Timers Test           : 0 warnings, 4 errors
Network Type Test     : passed
Area ID Test          : passed
Interface Mtu Test    : 0 warnings, 2 errors
Service Status Test   : passed

Timers Test details:
Hostname         Interface                 PeerID                    Peer IP
Reason                                        Last Changed
```

```
---------------- ----------------------- ----------------------- -----------------------
----------------------------------------- -----------------------
spine-1         downlink-4          torc-22            uplink-1           dead time
mismatch                  Mon Jul  1 16:18:33 2019
spine-1         downlink-4          torc-22            uplink-1           hello time
mismatch                 Mon Jul  1 16:18:33 2019
torc-22         uplink-1            spine-1            downlink-4         dead time
mismatch                  Mon Jul  1 16:19:21 2019
torc-22         uplink-1            spine-1            downlink-4         hello time
mismatch                 Mon Jul  1 16:19:21 2019

Interface Mtu Test details:
Hostname        Interface           PeerID             Peer IP
Reason                                Last Changed
---------------- ----------------------- ----------------------- -----------------------
----------------------------------------- -----------------------
spine-2         downlink-6          0.0.0.22           27.0.0.22          mtu
mismatch                       Mon Jul  1 16:19:02 2019
tor-2           uplink-2            0.0.0.20           27.0.0.20          mtu
mismatch                       Mon Jul  1 16:19:37 2019
```

### Perform a Sensors Validation

Hardware platforms have a number sensors to provide environmental data about the switches. Knowing these are all within range is a good check point for maintenance.

For example, if you had a temporary HVAC failure and you are concerned that some of your nodes are beginning to overheat, you can run this validation to determine if any switches have already reached the maximum temperature threshold.

```
cumulus@switch:~$ netq check sensors
sensors check result summary:

Checked nodes       : 8
Total nodes         : 8
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Additional summary:
Checked Sensors     : 136
Failed Sensors      : 0

PSU sensors Test          : passed,
Fan sensors Test          : passed,
Temperature sensors Test  : passed,
```

### Perform a VLAN Validation

Validate that VLANS are configured and operating properly:

```
cumulus@switch:~$ netq check vlan
vlan check result summary:

Checked nodes       : 12
Total nodes         : 12
Rotten nodes        : 0
Failed nodes        : 0
```

```
Warning nodes       : 0

Additional summary:
Failed Link Count   : 0
Total Link Count    : 196

Link Neighbor VLAN Consistency Test   : passed,
Clag Bond VLAN Consistency Test       : passed,
```

### Perform a VXLAN Validation

Validate that VXLANs are configured and operating properly:

```
cumulus@switch:~$ netq check vxlan
vxlan check result summary:

Checked nodes       : 6
Total nodes         : 6
Rotten nodes        : 0
Failed nodes        : 0
Warning nodes       : 0

Vlan Consistency Test   : passed,
BUM replication Test    : passed,
```

> TIP
>
> Both asymmetric and symmetric VXLAN configurations are validated with this command.

## Validation Check Result Filtering

You can create filters to suppress false alarms or uninteresting errors and warnings that can be a nuisance in CI workflows. For example, certain configurations permit a singly-connected CLAG bond and the standard error that is generated is not useful.

> NOTE
>
> Filtered errors and warnings related to validation checks do NOT generate notifications and are not counted in the alarm and info event totals. They are counted as part of suppressed notifications instead.

The filters are defined in the `check-filter.yml` file in the `/etc/netq/` directory. You can create a rule for individual check commands or you can create a global rule that applies to all tests run by the check command. Additionally, you can create a rule specific to a particular test run by the check command.

Each rule must contain at least one `match` criteria and an `action` response. The only action currently available is *filter*. The match can be comprised of multiple criteria, one per line, creating a logical AND. Matches can be made against any column in the validation check output. The match criteria values *must match* the case and spacing of the column names in the corresponding `netq check` output and are parsed as regular expressions.

This example shows a global rule for the BGP checks that indicates any events generated by the *DataVrf* virtual route forwarding interface coming from *swp3* or *swp7.* are to be suppressed. It also shows a test-specific rule to filter all Address Families events from devices with hostnames starting with *exit-1* or *firewall*.

```
bgp:
  global:
    - rule:
      match:
        VRF: DataVrf
        Peer Name: (swp3|swp7.)
      action:
        filter
  tests:
    Address Families:
      - rule:
        match:
          Hostname: (^exit1|firewall)
        action:
          filter
```

## View the History of a MAC Address

It is useful when debugging to be able to see when a MAC address is learned, when and where it moved in the network after that, if there was a duplicate at any time, and so forth. The `netq show mac-history` command makes this information available. It enables you to see:

- each change that was made chronologically

- changes made between two points in time, using the `between` option
- only the difference between to points in time using the `diff` option
- to order the output by selected output fields using the `listby` option
- each change that was made for the MAC address on a particular VLAN, using the `vlan` option

And as with many NetQ commands, the default time range used is now to one hour ago. You can view the output in JSON format as well.

The syntax of the command is:

```
netq [<hostname>] show mac-history <mac> [vlan <1-4096>] [diff] [between <text-time> and <text-endtime>] [listby <text-list-by>] [json]
```

NOTE

When entering a time value, you must include a numeric value *and* the unit of measure:

- d: day(s)
- h: hour(s)
- m: minute(s)
- s: second(s)
- now

For time ranges, the `<text-time>` is the most recent time and the `<text-endtime>` is the oldest time. The values do not have to have the same unit of measure.

This example shows how to view a full chronology of changes for a MAC Address. The carrot (^) notation indicates no change in this value from the row above.

```
cumulus@switch:~$ netq show mac-history 00:03:00:11:11:77 vlan 13

Matching mac-history records:
Last Changed              Hostname          VLAN   Origin Link             Destination
Remote Static
------------------------- ----------------- ------ ------ ---------------- ---------------------- ------ ------------
Mon Nov  4 20:21:13 2019  leaf01            13     no     bond01                                  no
no
Mon Nov  4 20:21:13 2019  leaf02            13     no     bond01                                  no
no
Mon Nov  4 20:21:13 2019  leaf04            13     no     vni13            10.0.0.112
yes    no
Mon Nov  4 20:21:13 2019  leaf03            13     no     vni13            10.0.0.112
yes    no
Mon Nov  4 20:22:40 2019  leaf03            ^      ^      bond03                                  no     ^
Mon Nov  4 20:22:40 2019  leaf04            13     no     vni13            10.0.0.112
yes    no
Mon Nov  4 20:22:40 2019  leaf02            13     no     vni13            10.0.0.134
yes    no
Mon Nov  4 20:22:40 2019  leaf01            13     no     vni13            10.0.0.134
yes    no
```

This example shows how to view the history of a MAC address by hostname. The carrot (^) notation indicates no change in this value from the row above.

```
cumulus@switch:~$ netq show mac-history 00:03:00:11:11:77 vlan 13 listby
hostname

Matching mac-history records:
Last Changed              Hostname          VLAN   Origin Link            Destination
Remote Static
------------------------- ----------------- ------ ------ ---------------- ---------------------- ------ ------------
Mon Nov  4 20:21:13 2019  leaf03            13     no     vni13            10.0.0.112
yes    no
Mon Nov  4 20:22:40 2019  leaf03            ^      ^      bond03                                  no     ^
Mon Nov  4 20:21:13 2019  leaf02            13     no     bond01                                  no
no
Mon Nov  4 20:22:40 2019  leaf02            ^      ^      vni13            10.0.0.134
yes    ^
Mon Nov  4 20:21:13 2019  leaf01            13     no     bond01                                  no
no
Mon Nov  4 20:22:40 2019  leaf01            ^      ^      vni13            10.0.0.134
yes    ^
Mon Nov  4 20:21:13 2019  leaf04            13     no     vni13            10.0.0.112
yes    no
Mon Nov  4 20:22:40 2019  leaf04            ^      ^      bond03                                  no     ^
```

This example shows show to view the history of a MAC address between now and two hours ago. The carrot (^) notation indicates no change in this value from the row above.

```
cumulus@switch:~$ netq show mac-history 00:03:00:11:11:77 vlan 13 between
now and 2h
```

```
Matching mac-history records:
Last Changed              Hostname          VLAN   Origin Link            Destination
Remote Static
------------------------ ----------------- ------ ------ ---------------- ---------------------- ------ ------------
Mon Nov  4 20:21:13 2019  leaf01            13     no     bond01                                  no
no
Mon Nov  4 20:21:13 2019  leaf02            13     no     bond01                                  no
no
Mon Nov  4 20:21:13 2019  leaf04            13     no     vni13            10.0.0.112
yes    no
Mon Nov  4 20:21:13 2019  leaf03            13     no     vni13            10.0.0.112
yes    no
Mon Nov  4 20:22:40 2019  leaf03            ^      ^      bond03                                  no    ^
Mon Nov  4 20:22:40 2019  leaf04            13     no     vni13            10.0.0.112
yes    no
Mon Nov  4 20:22:40 2019  leaf02            13     no     vni13            10.0.0.134
yes    no
Mon Nov  4 20:22:40 2019  leaf01            13     no     vni13            10.0.0.134
yes    no
```