CUMULUS

Cumulus NetQ 2.2

Deployment Guide

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This guide is intended for network administrators who are responsible for installation, setup, and maintenance of Cumulus NetQ in their data center environment. NetQ offers the ability to monitor and manage your data center network infrastructure and operational health with simple tools based on open source Linux. This guide provides instructions and information about installing NetQ core capabilities, configuring optional capabilities, and upgrading an existing NetQ installation. This guide assumes you have already installed Cumulus Linux on your network switches and you are ready to add these NetQ capabilities.

For information about monitoring and troubleshooting your network, refer to the Cumulus NetQ CLI User Guide or the Cumulus NetQ UI User Guide.

> Before you get started, you should review the release notes for this version.

Deployment Preface

A variety of resources are available for you to become familiar with Cumulus NetQ and aid in its deployment. These are identified here along with information about how the content is presented.

Contents

This topic describes...

What's New in Cumulus NetQ 2.2

Cumulus NetQ is now available as a cloud service, making it even easier to scale with your network growth. Just like Cumulus NetQ deployed in your premises, real-time data collection and fabric-wide performance analysis are available through the cloud service. New functionality has also been added to the NetQ UI.

Cumulus NetQ 2.2.0 includes the following new features and improvements:

For on-site and SaaS

- Graphical User Interface (UI)
    - Added ability to monitor and validate OSPF network protocol and services operation
    - Added ability to validate MTU, Sensors, VLAN and VXLAN protocols
    - Added events for MTU, OSPF, VLAN, and VXLAN
    - Added new standard user role, *user*, with reduced access permission compared to the administrative user

For SaaS only

- Released new Cumulus NetQ Cloud Appliance to speed deployment and get monitoring as quickly as possible
- Added CLI support for installation and configuration of the Cumulus NetQ Cloud Appliance
- Added support for multiple data centers

For further information regarding new features, improvements, bug fixes, and known issues present in this release, refer to the release notes.

Available Documentation

The NetQ documentation set has been reorganized and updated from prior releases. They still provide the information you need to proactively monitor your Linux-based network fabric using Cumulus NetQ. They assume that you have already installed Cumulus Linux and NetQ.

You may start anywhere in the documentation or read it from start to finish depending on your role and familiarity with the NetQ software and Linux networking. If you are new to NetQ, you may want to read the Cumulus NetQ Primer before reading the other available documents.

The following NetQ documents are available:

- Cumulus NetQ Deployment Guide (this guide)
- Cumulus NetQ CLI User Guide
- Cumulus NetQ UI User Guide
- Cumulus NetQ Release Notes
- What the NetQ Validation System Checks
- Cumulus NetQ Release Versioning and Support Policy
- Cumulus NetQ Cloud Release Versioning and Support Policy

Document Formatting

The Cumulus NetQ Deployment Guide uses the following typographical and note conventions.

Typographical Conventions

Throughout the guide, text formatting is used to convey contextual information about the content.

Text Format	Meaning
Green text	Link to additional content within the topic or to another topic
`Text in Monospace font`	Filename, directory and path names, and command usage
[`Text within square brackets`]	Optional command parameters; may be presented in mixed case or all caps text
<`Text within angle brackets`>	Required command parameter values–variables that are to be replaced with a relevant value; may be presented in mixed case or all caps text

Note Conventions

Several note types are used throughout the document. The formatting of the note indicates its intent and urgency.

✓ **Tip or Best Practice**

Offers information to improve your experience with the tool, such as time-saving or shortcut options, or i ndicates the common or recommended method for performing a particular task or process

ⓘ Information

Provides additional information or a reminder about a task or process that may impact your next step or selection

⚠ Caution

Advises that failure to take or avoid specific action can result in possible data loss

ⓘ Warning

Advises that failure to take or avoid specific action can result in possible physical harm to yourself, hardware equipment, or facility

Cumulus NetQ Primer

Cumulus® NetQ is a highly-scalable, modern network operations tool set that provides visibility and troubleshooting of your overlay and underlay networks in real-time. NetQ delivers actionable insights and operational intelligence about the health of your data center — from the container, virtual machine, or host, all the way to the switch and port. NetQ correlates configuration and operational status, and instantly identifies and tracks state changes while simplifying management for the entire Linux-based data center. With NetQ, network operations change from a manual, reactive, box-by-box approach to an automated, informed and agile one.

Cumulus NetQ performs three primary functions:

- **Data collection**: real-time and historical telemetry and network state information
- **Data analytics**: deep processing of the data
- **Data visualization**: rich graphical user interface (GUI) for actionable insight

NetQ is available as an on-site or SaaS deployment.

This documentation is current as of June 28, 2019 for version 2.2.0. Please visit the Cumulus Networks documentation site for the most up to date documentation.

Contents

This topic describes...

Cumulus NetQ Operational Advantages

Unlike other network operations tools, NetQ delivers significant operational improvements to your network management and maintenance processes. It simplifies the data center network by reducing the complexity through real-time visibility into hardware and software status and eliminating the guesswork associated with investigating issues through the analysis and presentation of detailed, focused data.

Demystify Overlay Networks

While overlay networks provide significant advantages in network management, it can be difficult to troubleshoot issues that occur in the overlay one box at a time. You are unable to correlate what events (configuration changes, power outages, etc.) may have caused problems in the network and when they occurred. Only a sampling of data is available to use for your analysis. By contrast, with Cumulus NetQ deployed, you have a network-wide view of the overlay network, can correlate events with what is happening now or in the past, and have real-time data to fill out the complete picture of your network health and operation.

In summary:

Without NetQ	With NetQ
Difficult to debug overlay network	View network-wide status of overlay network
Hard to find out what happened in the past	View historical activity with time-machine view
Periodically sampled data	Real-time collection of telemetry data for a more complete data set

Protect Network Integrity with NetQ Validation

Network configuration changes can cause numerous trouble tickets because you are not able to test a new configuration before deploying it. When the tickets start pouring in, you are stuck with a large amount of data that is collected and stored in multiple tools making correlation of the events to the resolution required difficult at best. Isolating faults in the past is challenging. By contract, with Cumulus NetQ deployed, you can proactively verify a configuration change as inconsistencies and misconfigurations can be caught prior to deployment. And historical data is readily available to correlate past events with current issues.

In summary:

Without NetQ	With NetQ
Reactive to trouble tickets	Catch inconsistencies and misconfigurations prior to deployment with integrity checks/validation
Large amount of data and multiple tools to correlate the logs/events with the issues	Correlate network status, all in one place
Periodically sampled data	Readily available historical data for viewing and correlating changes in the past with current issues

Active Network-wide Troubleshooting

Troubleshooting networks is challenging in the best of times, but trying to do so manually, one box at a time, and digging through a series of long and ugly logs make the job harder than it needs to be. Cumulus NetQ provides rolled up and correlated network status on a regular basis, enabling you to get down to the root of the problem quickly, whether it occurred recently or over a week ago. The graphical user interface make this possible visually to speed the analysis.

In summary:

Without NetQ	With NetQ
Large amount of data and multiple tools to correlate the logs/events with the issues	Rolled up and correlated network status, view events and status together
Past events are lost	Historical data gathered and stored for comparison with current network state
Manual, box-by-box troubleshooting	View issues on all devices all at once, pointing to the source of the problem

Track Connectivity with NetQ Trace

Conventional trace only traverses the data path looking for problems, and does so on a node to node basis. For paths with a small number of hops that might be fine, but in larger networks, it can become extremely time consuming. With Cumulus NetQ both the data and control paths are verified providing additional information. It discovers misconfigurations along all of the hops in one go, speeding the time to resolution.

In summary:

Without NetQ	With NetQ
Trace covers only data path; hard to check control path	Both data and control paths are verified

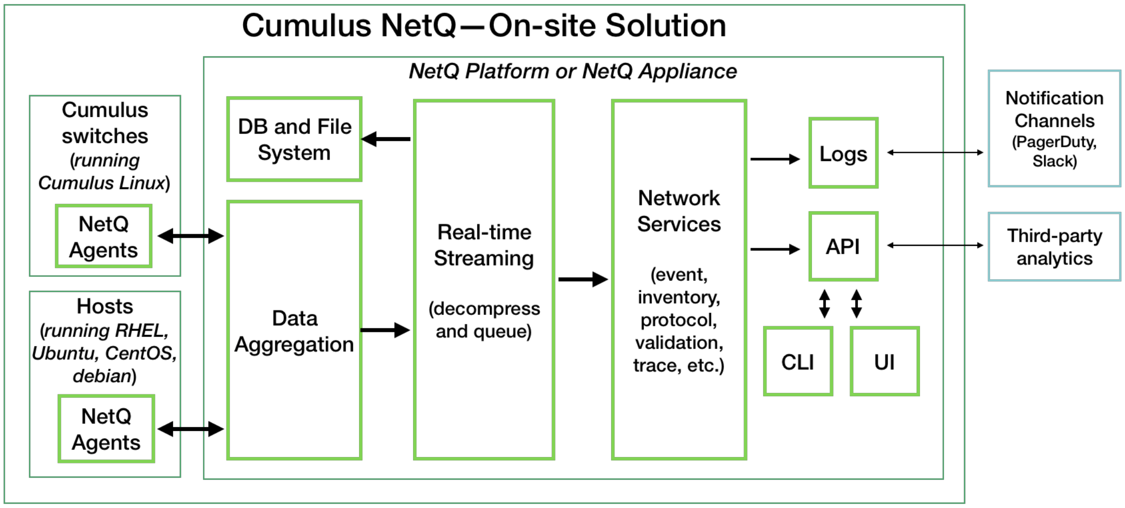
Without NetQ	With NetQ
View portion of entire path	View all paths between devices all at once to find problem paths
Node-to-node check on misconfigurations	View any misconfigurations along all hops from source to destination

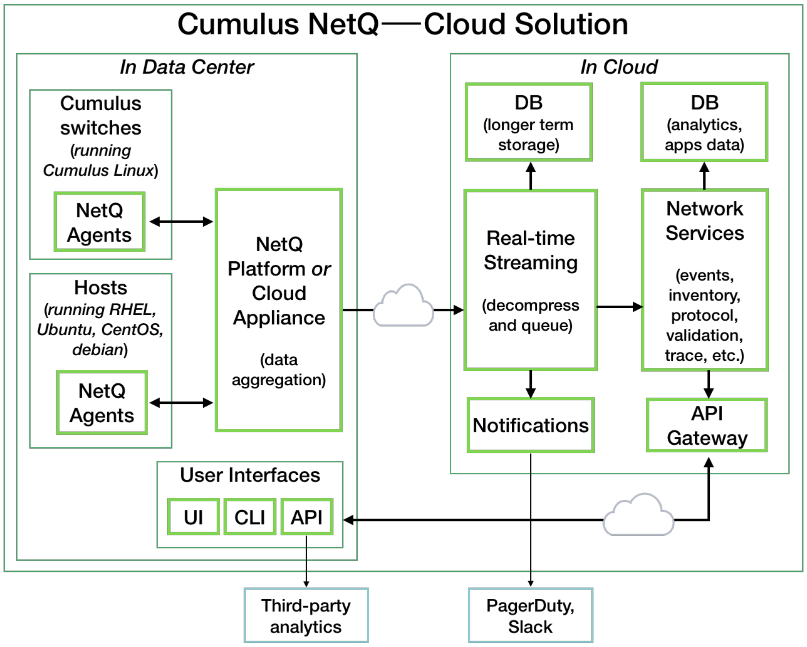
Cumulus NetQ Components

NetQ contains the following applications and key components:

- Telemetry data collection and aggregation
  - NetQ switch agents
  - NetQ host agents
  - Telemetry data aggregation
  - Database
- Data streaming
- Network services
- User interfaces

While these function apply to both the on-site and SaaS solution, where the functions reside varies, as shown here.


Cumulus NetQ—On-site Solution
NetQ Platform or NetQ Appliance
Cumulus switches (running Cumulus Linux)
NetQ Agents
Hosts (running RHEL, Ubuntu, CentOS, debian)
NetQ Agents
DB and File System
Data Aggregation
Real-time Streaming
(decompress and queue)
Network Services
(event, inventory, protocol, validation, trace, etc.)
Logs
API
CLI
UI
Notification Channels (PagerDuty, Slack)
Third-party analytics


Cumulus NetQ—Cloud Solution
In Data Center
Cumulus switches (running Cumulus Linux)
NetQ Agents
Hosts (running RHEL, Ubuntu, CentOS, debian)
NetQ Agents
NetQ Platform or Cloud Appliance (data aggregation)
User Interfaces
UI
CLI
API
In Cloud
DB (longer term storage)
DB (analytics, apps data)
Real-time Streaming (decompress and queue)
Network Services (events, inventory, protocol, validation, trace, etc.)
Notifications
API Gateway
Third-party analytics
PagerDuty, Slack

NetQ interfaces with event notification applications, third-party analytics tools.

Each of the NetQ components used to gather, store and process data about the network state are described here.

NetQ Agents

NetQ Agents are software installed and running on every monitored *node* in the network — including Cumulus® Linux® switches, Linux bare-metal hosts, and virtual machines. The NetQ Agents push network data regularly and event information immediately to the NetQ Platform.

Switch Agents

The NetQ Agents running on Cumulus Linux switches gather the following network data via Netlink:

- Interfaces
- IP addresses (v4 and v6)
- IP routes (v4 and v6)
- Links
- Bridge FDB (MAC Address table)
- ARP Entries/Neighbors (IPv4 and IPv6)

for the following protocols:

- Bridging protocols: LLDP, STP, MLAG
- Routing protocols: BGP, OSPF
- Network virtualization: EVPN, LNV, VXLAN

The NetQ Agent is supported on Cumulus Linux 3.3.2 and later.

Host Agents

The NetQ Agents running on hosts gather the same information as that for switches, plus the following network data:

- Network IP and MAC addresses
- Container IP and MAC addresses

The NetQ Agent obtains container information by listening to the Kubernetes orchestration tool.

The NetQ Agent is supported on hosts running Ubuntu 16.04, Red Hat® Enterprise Linux 7, and CentOS 7 Operating Systems.

NetQ Components

The NetQ components perform the data collection, storage, and processing for delivery to various user interfaces. It is comprised of a collection of scalable components running entirely within a single server. The NetQ software queries this server, rather than individual devices enabling greater scalability of the system. Each of these components is described briefly here.

Data Aggregation

The data aggregation component collects data coming from all of the NetQ Agents. It then filters, compresses, and forwards the data to the streaming component. The server monitors for missing messages and also monitors the NetQ Agents themselves, providing alarms when appropriate. In addition to the telemetry data collected from the NetQ Agents, the aggregation component collects information from the switches and hosts, such as vendor, model, version, and basic operational state.

Data Stores

Two types of data stores are used in the NetQ product. The first stores the raw data, data aggregations, and discrete events needed for quick response to data requests. The second stores data based on correlations, transformations and processing of the raw data.

Real-time Streaming

The streaming component processes the incoming raw data from the aggregation server in real time. It reads the metrics and stores them as a time series, and triggers alarms based on anomaly detection, thresholds, and events.

Network Services

The network services component monitors protocols and services operation individually and on a network-wide basis and stores status details.

User Interfaces

NetQ data is available through several user interfaces:

- NetQ CLI (command line interface)
- NetQ UI (graphical user interface)

- NetQ RESTful API (representational state transfer application programming interface)

The CLI and UI query the RESTful API for the data to present. Standard integrations can be configured to integrate with third-party notification tools.

Data Center Network Deployments

T here are two deployment types that are commonly deployed for network management in the data center:

- Out-of-Band Management (recommended)
- In-band Management

A summary of each type is provided here.

> ⓘ NetQ operates over layer 3, and can be used in both layer 2 bridged and layer 3 routed environments. Cumulus Networks always recommends layer 3 routed environments whenever possible.

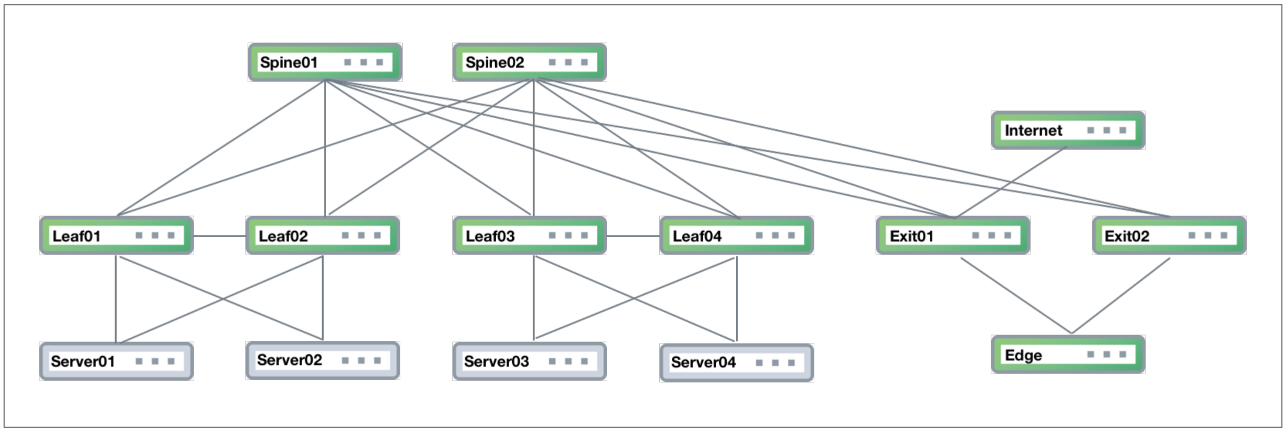
Out-of-Band Management Deployment

Cumulus Networks recommends deploying NetQ on an out-of-band (OOB) management network to separate network management traffic from standard network data traffic, but it is not required. This figure shows a sample CLOS-based network fabric design for a data center using an OOB management network overlaid on top, where NetQ is deployed.

The physical *network* hardware includes:

- **Spine** switches: where data is aggregated and distributed ; also known as an aggregation switch, end-of-row (EOR) switch or distribution switch
- **Leaf** switches: where servers connect to the network; also known as a Top of Rack (TOR) or access switch
- **Server** hosts: where applications are hosted and data served to the user through the network
- **Exit** switch: where connections to outside the data center occur ; also known as Border Leaf or Service Leaf
- **Edge** server (optional): where the firewall is the demarcation point, peering may occur through the exit switch layer to Internet (PE) devices
- **Internet** device (PE): where provider edge (PE) equipment communicates at layer 3 with the network fabric

The diagram shows physical connections (in the form of grey lines) between Spine 01 and four Leaf devices and two Exit devices, and Spine 02 and the same four Leaf devices and two Exit devices. Leaf 01 and Leaf 02 are connected to each other over a peerlink and act as an MLAG pair for Server 01 and Server 02. Leaf 03 and Leaf 04 are connected to each other over a peerlink and act as an MLAG pair for Server 03 and Server 04. The Edge is connected to both Exit devices, and the Internet node is connected to Exit 01.

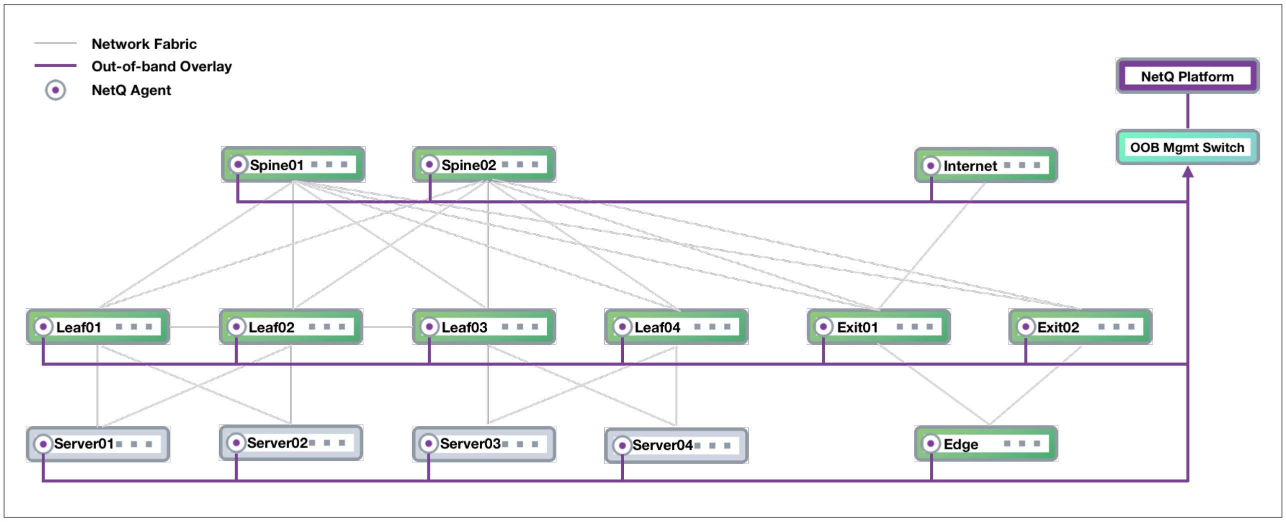


Data Center Network Example

The physical *management* hardware includes:

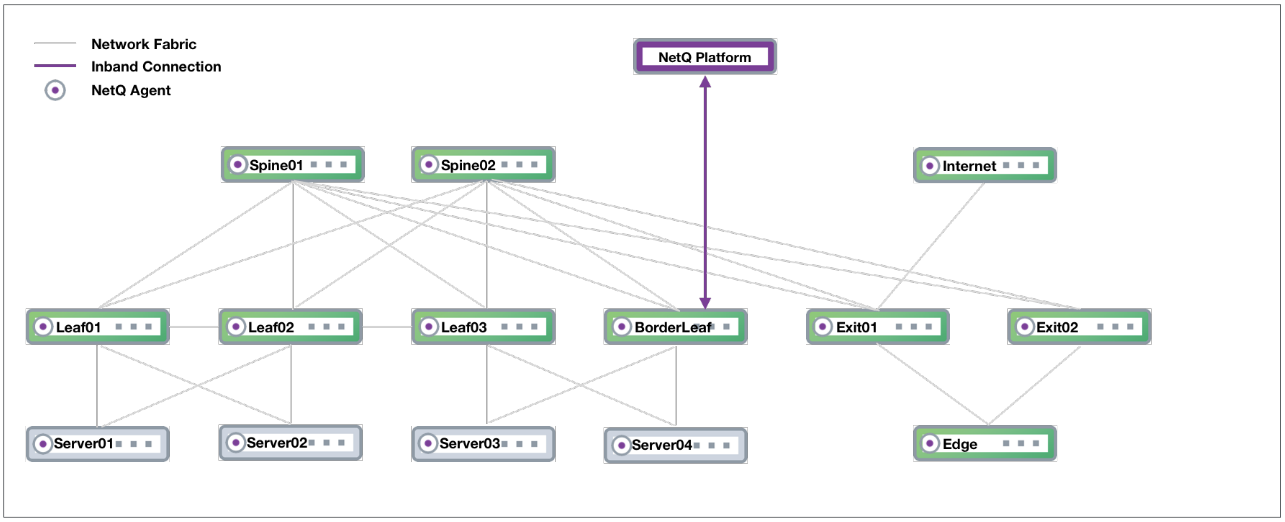
- OOB Mgmt Switch: aggregation switch that connects to all of the network devices through communications with the NetQ Agent on each node
- NetQ Platform: hosts the telemetry software, database and user interfaces (refer to description above).

These switches are connected to each of the physical network devices through a virtual network overlay, shown with purple lines.



In-band Management Deployment

While not the preferred deployment method, you might choose to implement NetQ within your data network. In this scenario, there is no overlay and all traffic to and from the NetQ Agents and the NetQ Platform traverses the data paths along with your regular network traffic. The roles of the switches in the CLOS network are the same, except that the NetQ Platform performs the aggregation function that the OOB management switch performed. If your network goes down, you might not have access to the NetQ Platform for troubleshooting.

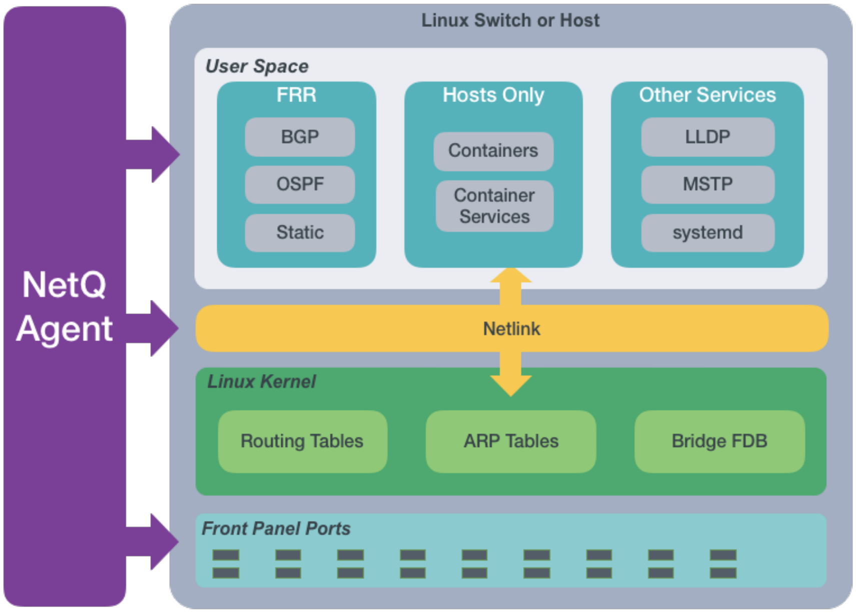


NetQ Operation

In any of the above deployments, NetQ offers network-wide configuration and device management, proactive monitoring capabilities, and performance diagnostics for complete management of your network. Each component of the solution provides a critical element to make this possible.

The NetQ Agent

From a software perspective, a network switch has software associated with the hardware platform, the operating system, and communications. For data centers, the software on a Cumulus Linux network switch would be similar to the diagram shown here.



The NetQ Agent interacts with the various components and software on switches and hosts and provides the gathered information to the NetQ Platform. You can view the data using the NetQ CLI or UI.

The NetQ Agent p olls the user space applications for information about the performance of the various routing protocols and services that are running on the switch. Cumulus Networks supports BGP and OSPF Free Range Routing (FRR) protocols as well as static addressing. Cumulus Linux also supports LLDP and

MSTP among other protocols, and a variety of services such as systemd and sensors . For hosts, the NetQ Agent also polls for performance of containers managed with Kubernetes. All of this information is used to provide the current health of the network and verify it is configured and operating correctly.

For example, if the NetQ Agent learns that an interface has gone down, a new BGP neighbor has been configured, or a container has moved, it provides that information to the NetQ Platform . That information can then be used to notify users of the operational state change through various channels. By default, data is logged in the database, but you can use the CLI (`netq show events`) or configure the Event Service in NetQ to send the information to a third-party notification application as well. NetQ supports PagerDuty and Slack integrations.

The NetQ Agent interacts with the Netlink communications between the Linux kernel and the user space, listening for changes to the network state, configurations, routes and MAC addresses. NetQ uses this information to enable notifications about these changes so that network operators and administrators can respond quickly when changes are not expected or favorable.

For example, if a new route is added or a MAC address removed, NetQ Agent records these changes and sends that information to the NetQ Platform . Based on the configuration of the Event Service, these changes can be sent to a variety of locations for end user response.

The NetQ Agent also interacts with the hardware platform to obtain performance information about various physical components, such as fans and power supplies, on the switch. Operational states and temperatures are measured and reported, along with cabling information to enable management of the hardware and cabling, and proactive maintenance.

For example, as thermal sensors in the switch indicate that it is becoming very warm, various levels of alarms are generated. These are then communicated through notifications according to the Event Service configuration.

The NetQ Platform

Once the collected data is sent to and stored in the NetQ database, you can:

- Validate configurations, identifying misconfigurations in your current network, in the past, or prior to deployment,
- Monitor communication paths throughout the network,
- Notify users of issues and management information,
- Anticipate impact of connectivity changes,
- and so forth.

Validate Configurations

The NetQ CLI enables validation of your network health through two sets of commands: `netq check` and `netq show`. They extract the information from the Network Service component and Event service. The Network Service component is continually validating the connectivity and configuration of the devices and protocols running on the network. Using the `netq check` and `netq show` commands displays the status of the various components and services on a network-wide and complete software stack basis. For example, you can perform a network-wide check on all sessions of BGP with a single `netq check bgp` command. The command lists any devices that have misconfigurations or other operational errors in seconds. When errors or misconfigurations are present, using the `netq show bgp` command displays the BGP configuration on each device so that you can compare and contrast each device, looking for potential causes. `netq check` and `netq show` commands are available for numerous components and services as shown in the following table.

Component or Service	Check	Show	Component or Service	Check	Show
Agents	★	★	LLDP		★
BGP	★	★	LNV	★	★
CLAG (MLAG)	★	★	MACs		★
Events		★	MTU	★	
EVPN	★	★	NTP	★	★
Interfaces	★	★	OSPF	★	★
Inventory		★	Sensors	★	★
IPv4/v6		★	Services		★
Kubernetes		★	VLAN	★	★
License	★		VXLAN	★	★

Monitor Communication Paths

The trace engine is used to validate the available communication paths between two network devices. The corresponding `netq trace` command enables you to view all of the paths between the two devices and if there are any breaks in the paths. This example shows two successful paths between server12 and leaf11, all with an MTU of 9152. The first command shows the output in path by path tabular mode. The second command show the same output as a tree.

```
cumulus@switch:~$ netq trace 10.0.0.13 from 10.0.0.21
Number of Paths: 2
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 9152
Id  Hop Hostname    InPort          InTun, RtrIf    OutRtrIf, Tun
OutPort
--- --- ----------- --------------- --------------- ---------------
---------------
1   1   server12
bond1.1002
```

```
    2   leaf12      swp8                            vlan1002
peerlink-1
    3   leaf11      swp6            vlan1002
vlan1002
--- --- ----------- --------------- --------------- ---------------
---------------
2   1   server12
bond1.1002
    2   leaf11      swp8
vlan1002
--- --- ----------- --------------- --------------- ---------------
---------------


cumulus@switch:~$ netq trace 10.0.0.13 from 10.0.0.21 pretty
Number of Paths: 2
Number of Paths with Errors: 0
Number of Paths with Warnings: 0
Path MTU: 9152
 hostd-12 bond1.1002 -- swp8 leaf12 <vlan1002> peerlink-1 -- swp6
<vlan1002> leaf11 vlan1002
          bond1.1002 -- swp8 leaf11 vlan1002
```

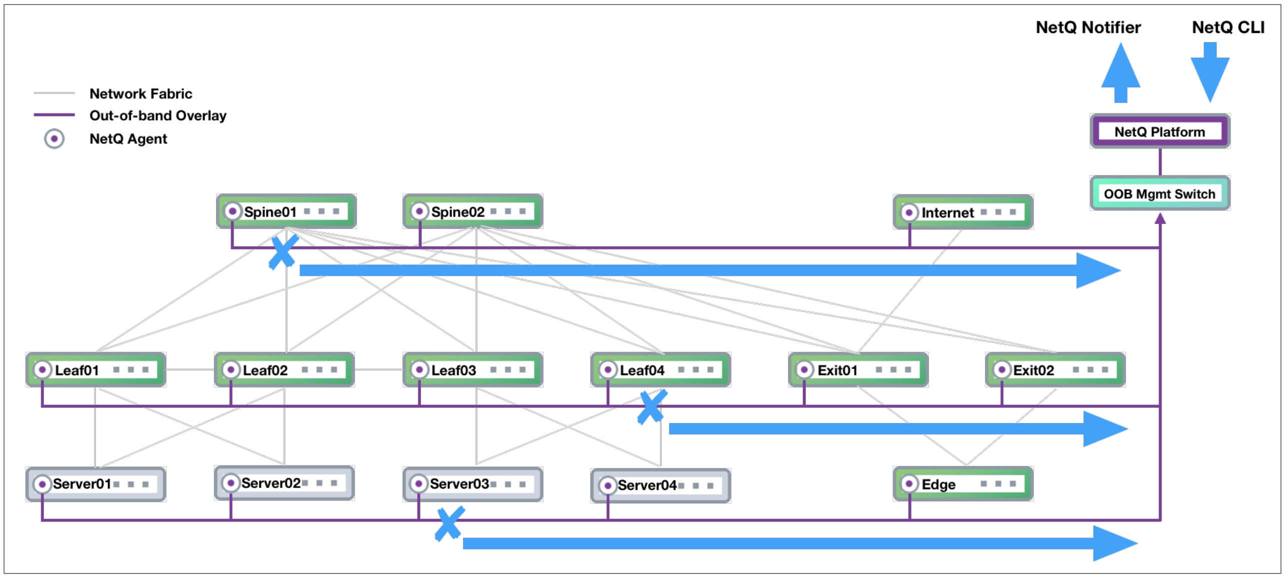
This output is read as:

- Path 1 traverses the network from server12 out bond1.1002 into leaf12 interface swp8 out VLAN1002 peerlink-1 into VLAN1002 interface swp6 on leaf11
- Path 2 traverses the network from server12 out bond1.1002 into VLAN1002 interface swp8 on leaf11.

If the MTU does not match across the network, or any of the paths or parts of the paths have issues, that data is called out in the summary at the top of the output and shown in red along the paths, giving you a starting point for troubleshooting.

View Historical State and Configuration

All of the check, show and trace commands can be run for the current status and for a prior point in time. For example, this is useful when you receive messages from the night before, but are not seeing any problems now. You can use the `netq check` command to look for configuration or operational issues around the time that the messages are timestamped. Then use the `netq show` commands to see information about how the devices in question were configured at that time or if there were any changes in a given timeframe. Optionally, you can use the `netq trace` command to see what the connectivity looked like between any problematic nodes at that time. This example shows problems occurred on spine01, leaf04, and server03 last night. The network administrator received notifications and wants to investigate. The diagram is followed by the commands to run to determine the cause of a BGP error on spine01. Note that the commands use the `around` option to see the results for last night and that they can be run from any switch in the network.



```
cumulus@switch:~$ netq check bgp around 30m
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:2h:6m:21s

SAFI evpn not activated on peer
exit-1            DataVrf1080     swp7.2            firewall-2
BGP session with peer firewall-2 (swp7.2 vrf  1d:1h:59m:43s

DataVrf1080) failed,

reason: Peer not configured
exit-1            DataVrf1081     swp6.3            firewall-1
BGP session with peer firewall-1 swp6.3: AFI/ 1d:2h:6m:21s

SAFI evpn not activated on peer
exit-1            DataVrf1081     swp7.3            firewall-2
BGP session with peer firewall-2 (swp7.3 vrf  1d:1h:59m:43s

DataVrf1081) failed,

reason: Peer not configured
exit-1            DataVrf1082     swp6.4            firewall-1
BGP session with peer firewall-1 swp6.4: AFI/ 1d:2h:6m:21s

SAFI evpn not activated on peer
```

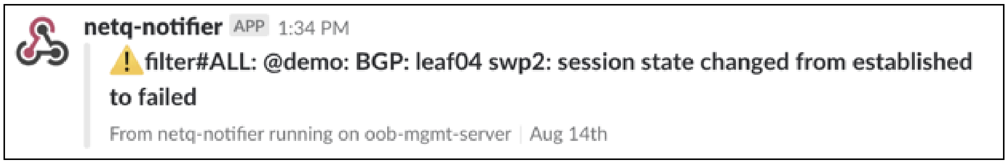
```
exit-1            DataVrf1082     swp7.4            firewall-2
BGP session with peer firewall-2 (swp7.4 vrf  1d:1h:59m:43s

DataVrf1082) failed,

reason: Peer not configured
exit-1            default         swp6              firewall-1
BGP session with peer firewall-1 swp6: AFI/SA 1d:2h:6m:21s

FI evpn not activated on peer
exit-1            default         swp7              firewall-2
BGP session with peer firewall-2 (swp7 vrf de 1d:1h:59m:43s
...

cumulus@switch:~$ netq exit-1 show bgp
Matching bgp records:
Hostname          Neighbor                     VRF
ASN        Peer ASN   PfxRx        Last Changed
----------------- ---------------------------- ---------------
---------- ---------- ------------ -------------------------
exit-1            swp3(spine-1)                default
655537     655435     27/24/412    Fri Feb 15 17:20:00 2019
exit-1            swp3.2(spine-1)              DataVrf1080
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp3.3(spine-1)              DataVrf1081
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp3.4(spine-1)              DataVrf1082
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp4(spine-2)                default
655537     655435     27/24/412    Fri Feb 15 17:20:00 2019
exit-1            swp4.2(spine-2)              DataVrf1080
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp4.3(spine-2)              DataVrf1081
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp4.4(spine-2)              DataVrf1082
655537     655435     13/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp5(spine-3)                default
655537     655435     28/24/412    Fri Feb 15 17:20:00 2019
exit-1            swp5.2(spine-3)              DataVrf1080
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp5.3(spine-3)              DataVrf1081
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp5.4(spine-3)              DataVrf1082
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp6(firewall-1)             default
655537     655539     73/69/-      Fri Feb 15 17:22:10 2019
exit-1            swp6.2(firewall-1)           DataVrf1080
655537     655539     73/69/-      Fri Feb 15 17:22:10 2019
exit-1            swp6.3(firewall-1)           DataVrf1081
655537     655539     73/69/-      Fri Feb 15 17:22:10 2019
exit-1            swp6.4(firewall-1)           DataVrf1082
655537     655539     73/69/-      Fri Feb 15 17:22:10 2019
```

```
exit-1            swp7                         default
655537     -          NotEstd      Fri Feb 15 17:28:48 2019
exit-1            swp7.2                       DataVrf1080
655537     -          NotEstd      Fri Feb 15 17:28:48 2019
exit-1            swp7.3                       DataVrf1081
655537     -          NotEstd      Fri Feb 15 17:28:48 2019
exit-1            swp7.4                       DataVrf1082
655537     -          NotEstd      Fri Feb 15 17:28:48 2019
```

Manage Network Events

The NetQ notifier manages the events that occur for the devices and components, protocols and services that it receives from the NetQ Agents. The notifier enables you to capture and filter events that occur to manage the behavior of your network. This is especially useful when an interface or routing protocol goes down and you want to get them back up and running as quickly as possible, preferably before anyone notices or complains. You can improve resolution time significantly by creating filters that focus on topics appropriate for a particular group of users. You can easily create filters around events related to BGP, LNV, and MLAG session states, interfaces, links, NTP and other services, fans, power supplies, and physical sensor measurements.

For example, for operators responsible for routing, you can create an integration with a notification application that notifies them of routing issues as they occur. This is an example of a Slack message received on a *netq-notifier* channel indicating that the BGP session on switch *leaf04* interface *swp2* has gone down.



netq-notifier APP 1:34 PM

⚠ **filter#ALL: @demo: BGP: leaf04 swp2: session state changed from established to failed**

From netq-notifier running on oob-mgmt-server | Aug 14th

Timestamps in NetQ

Every event or entry in the NetQ database is stored with a timestamp of when the event was captured by the NetQ Agent on the switch or server. This timestamp is based on the switch or server time where the NetQ Agent is running, and is pushed in UTC format. It is important to ensure that all devices are NTP synchronized to prevent events from being displayed out of order or not displayed at all when looking for events that occurred at a particular time or within a time window.

Interface state, IP addresses, routes, ARP/ND table (IP neighbor) entries and MAC table entries carry a timestamp that represents the time the event happened (such as when a route is deleted or an interface comes up) — *except* the first time the NetQ agent is run. If the network has been running and stable when a NetQ agent is brought up for the first time, then this time reflects when the agent was started. Subsequent changes to these objects are captured with an accurate time of when the event happened.

Data that is captured and saved based on polling, and just about all other data in the NetQ database, including control plane state (such as BGP or MLAG), has a timestamp of when the information was *captured* rather than when the event *actually happened*, though NetQ compensates for this if the data extracted provides additional information to compute a more precise time of the event. For example, BGP uptime can be used to determine when the event actually happened in conjunction with the timestamp.

When retrieving the timestamp, command outputs display the time in three ways:

- For non-JSON output when the timestamp represents the Last Changed time, time is displayed in actual date and time when the time change occurred
- For non-JSON output when the timestamp represents an Uptime, time is displayed as days, hours, minutes, and seconds from the current time.

- For JSON output, time is displayed in microseconds that have passed since the Epoch time (January 1, 1970 at 00:00:00 GMT) .

This example shows the difference between the timestamp displays.

```
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     27/24/412    Fri Feb 15 17:20:00 2019
exit-1            swp3.2(spine-1)              DataVrf1080
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp3.3(spine-1)              DataVrf1081
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp3.4(spine-1)              DataVrf1082
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp4(spine-2)                default
655537     655435     27/24/412    Fri Feb 15 17:20:00 2019
exit-1            swp4.2(spine-2)              DataVrf1080
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp4.3(spine-2)              DataVrf1081
655537     655435     14/12/0      Fri Feb 15 17:20:00 2019
exit-1            swp4.4(spine-2)              DataVrf1082
655537     655435     13/12/0      Fri Feb 15 17:20:00 2019
...

cumulus@switch:~$ netq show agents
Matching agents records:
Hostname          Status           NTP Sync
Version                              Sys Uptime                Agent
Uptime              Reinitialize Time         Last Changed
----------------- ---------------- --------
------------------------------------ -------------------------
------------------------- --------------------------
-------------------------
leaf01            Fresh            yes      2.0.0-cl3u11~1549993210.
e902a94      2h:32m:33s                2h:26m:19s                2h:
26m:19s                 Tue Feb 12 18:13:28 2019
leaf02            Fresh            yes      2.0.0-cl3u11~1549993210.
e902a94      2h:32m:33s                2h:26m:14s                2h:
26m:14s                 Tue Feb 12 18:13:33 2019
leaf11            Fresh            yes      2.0.0-ub16.
04u11~1549993314.e902a94  2h:32m:28s                2h:25m:
49s                2h:25m:49s                 Tue Feb 12 18:17:32 2019
leaf12            Fresh            yes      2.0.0-rh7u11~1549992132.
c42c08f      2h:32m:0s                 2h:25m:44s                2h:
25m:44s                 Tue Feb 12 18:17:36 2019
```

```
leaf21            Fresh            yes      2.0.0-ub16.
04u11~1549993314.e902a94  2h:32m:28s               2h:25m:
39s               2h:25m:39s               Tue Feb 12 18:17:42 2019
leaf22            Fresh            yes      2.0.0-rh7u11~1549992132.
c42c08f      2h:32m:0s               2h:25m:35s               2h:
25m:35s               Tue Feb 12 18:17:46 2019
spine01           Fresh            yes      2.0.0-cl3u11~1549993210.
e902a94      2h:32m:33s              2h:27m:11s               2h:
27m:11s               Tue Feb 12 18:13:06 2019
spine02           Fresh            yes      2.0.0-cl3u11~1549993210.
e902a94      2h:32m:33s              2h:27m:6s                2h:
27m:6s                Tue Feb 12 18:13:11 2019
...

cumulus@switch:~$ netq show agents json
{
    "agents":[
        {
            "status":"Fresh",
            "lastChanged":1549995208.3039999008,
            "reinitializeTime":1549995146.0,
            "hostname":"leaf01",
            "version":"2.0.0-cl3u11~1549993210.e902a94",
            "sysUptime":1549994772.0,
            "ntpSync":"yes",
            "agentUptime":1549995146.0
        },
        {
            "status":"Fresh",
            "lastChanged":1549995213.3399999142,
            "reinitializeTime":1549995151.0,
            "hostname":"leaf02",
            "version":"2.0.0-cl3u11~1549993210.e902a94",
            "sysUptime":1549994772.0,
            "ntpSync":"yes",
            "agentUptime":1549995151.0
        },
        {
            "status":"Fresh",
            "lastChanged":1549995434.3559999466,
            "reinitializeTime":1549995157.0,
            "hostname":"leaf11",
            "version":"2.0.0-ub16.04u11~1549993314.e902a94",
            "sysUptime":1549994772.0,
            "ntpSync":"yes",
            "agentUptime":1549995157.0
        },
        {
            "status":"Fresh",
            "lastChanged":1549995439.3770000935,
            "reinitializeTime":1549995164.0,
            "hostname":"leaf12",
            "version":"2.0.0-rh7u11~1549992132.c42c08f",
            "sysUptime":1549994809.0,
            "ntpSync":"yes",
            "agentUptime":1549995164.0
        },
        {
            "status":"Fresh",
            "lastChanged":1549995452.6830000877,
            "reinitializeTime":1549995176.0,
            "hostname":"leaf21",
            "version":"2.0.0-ub16.04u11~1549993314.e902a94",
            "sysUptime":1549994777.0,
            "ntpSync":"yes",
            "agentUptime":1549995176.0
        },
        {
            "status":"Fresh",
            "lastChanged":1549995456.4500000477,
            "reinitializeTime":1549995181.0,
            "hostname":"leaf22",
            "version":"2.0.0-rh7u11~1549992132.c42c08f",
            "sysUptime":1549994805.0,
            "ntpSync":"yes",
            "agentUptime":1549995181.0
        },
        {
            "status":"Fresh",
            "lastChanged":1549995186.3090000153,
            "reinitializeTime":1549995094.0,
            "hostname":"spine01",
            "version":"2.0.0-cl3u11~1549993210.e902a94",
            "sysUptime":1549994772.0,
            "ntpSync":"yes",
            "agentUptime":1549995094.0
        },
        {
            "status":"Fresh",
            "lastChanged":1549995191.4530000687,
            "reinitializeTime":1549995099.0,
            "hostname":"spine02",
            "version":"2.0.0-cl3u11~1549993210.e902a94",
            "sysUptime":1549994772.0,
            "ntpSync":"yes",
            "agentUptime":1549995099.0
        },
...
```

⚠

If a NetQ Agent is restarted on a device, the timestamps for existing objects are not updated to reflect this new restart time. Their timestamps are preserved relative to the original start time of the Agent. A rare exception is if the device is rebooted between the time it takes the Agent being stopped and restarted; in this case, the time is once again relative to the start time of the Agent.

Exporting NetQ Data

Data from the NetQ Platform can be exported in a couple of ways:

- use the `json` option to output command results to JSON format for parsing in other applications
- use the UI to export data from the full screen cards

Example Using the CLI

You can check the state of BGP on your network with `netq check bgp`:

```
cumulus@leaf01:~$ netq check bgp
Total Nodes: 25, Failed Nodes: 3, Total Sessions: 220 , Failed
Sessions: 24,
Hostname          VRF             Peer Name         Peer Hostname
Reason                                        Last Changed
----------------- --------------- ----------------- -----------------
---------------------------------------------
-------------------------
exit01            DataVrf1080     swp6.2            firewall01
BGP session with peer firewall01 swp6.2: AFI/ Tue Feb 12 18:11:16 2019

SAFI evpn not activated on peer
exit01            DataVrf1080     swp7.2            firewall02
BGP session with peer firewall02 (swp7.2 vrf  Tue Feb 12 18:11:27 2019

DataVrf1080) failed,

reason: Peer not configured
exit01            DataVrf1081     swp6.3            firewall01
BGP session with peer firewall01 swp6.3: AFI/ Tue Feb 12 18:11:16 2019

SAFI evpn not activated on peer
exit01            DataVrf1081     swp7.3            firewall02
BGP session with peer firewall02 (swp7.3 vrf  Tue Feb 12 18:11:27 2019

DataVrf1081) failed,

reason: Peer not configured
...
```

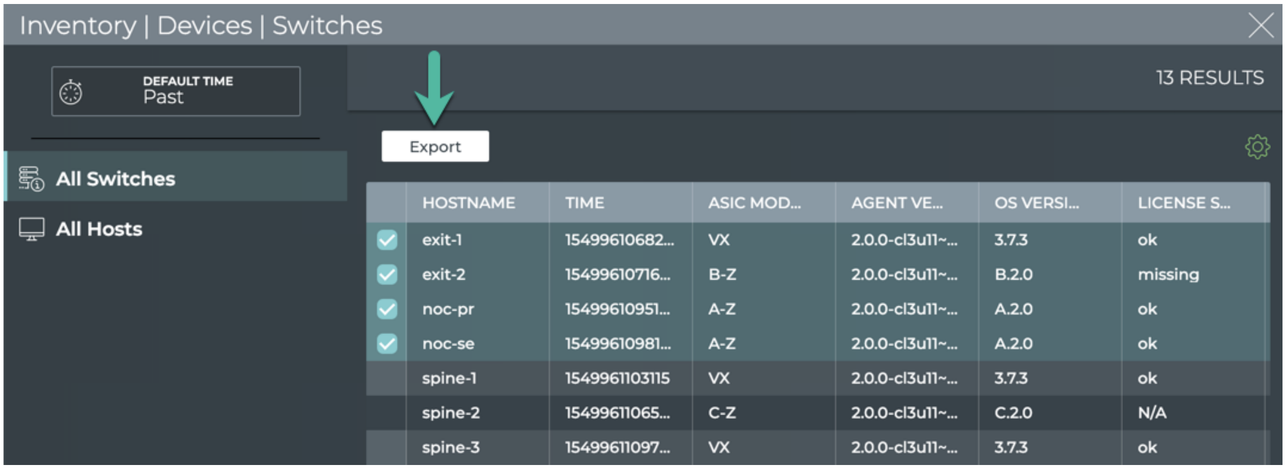
When you show the output in JSON format, this same command looks like this:

```
cumulus@leaf01:~$ netq check bgp json
```

```
{
    "failedNodes":[
        {
            "peerHostname":"firewall01",
            "lastChanged":1549995080.0,
            "hostname":"exit01",
            "peerName":"swp6.2",
            "reason":"BGP session with peer firewall01 swp6.2: AFI
/SAFI evpn not activated on peer",
            "vrf":"DataVrf1080"
        },
        {
            "peerHostname":"firewall02",
            "lastChanged":1549995449.7279999256,
            "hostname":"exit01",
            "peerName":"swp7.2",
            "reason":"BGP session with peer firewall02 (swp7.2 vrf
DataVrf1080) failed, reason: Peer not configured",
            "vrf":"DataVrf1080"
        },
        {
            "peerHostname":"firewall01",
            "lastChanged":1549995080.0,
            "hostname":"exit01",
            "peerName":"swp6.3",
            "reason":"BGP session with peer firewall01 swp6.3: AFI
/SAFI evpn not activated on peer",
            "vrf":"DataVrf1081"
        },
        {
            "peerHostname":"firewall02",
            "lastChanged":1549995449.7349998951,
            "hostname":"exit01",
            "peerName":"swp7.3",
            "reason":"BGP session with peer firewall02 (swp7.3 vrf
DataVrf1081) failed, reason: Peer not configured",
            "vrf":"DataVrf1081"
        },
...

    ],
    "summary": {
        "checkedNodeCount": 25,
        "failedSessionCount": 24,
        "failedNodeCount": 3,
        "totalSessionCount": 220
    }
}
```

Example Using the UI

Open the full screen Switch Inventory card, select the data to export, and click **Export**.



	HOSTNAME	TIME	ASIC MOD...	AGENT VE...	OS VERSI...	LICENSE S...
☑	exit-1	15499610682...	VX	2.0.0-cl3u11~...	3.7.3	ok
☑	exit-2	15499610716...	B-Z	2.0.0-cl3u11~...	B.2.0	missing
☑	noc-pr	15499610951...	A-Z	2.0.0-cl3u11~...	A.2.0	ok
☑	noc-se	15499610981...	A-Z	2.0.0-cl3u11~...	A.2.0	ok
	spine-1	1549961103115	VX	2.0.0-cl3u11~...	3.7.3	ok
	spine-2	15499611065...	C-Z	2.0.0-cl3u11~...	C.2.0	N/A
	spine-3	15499611097...	VX	2.0.0-cl3u11~...	3.7.3	ok

Key File Locations

The primary configuration file for all Cumulus NetQ tools, `netq.yml`, resides in `/etc/netq` by default.

Log files are stored in `/var/logs/` by default.

Refer to Investigate NetQ Issues for a complete listing of configuration files and logs for use in issue resolution.

Install NetQ

Installing NetQ can be accomplished in one of three ways:

- If you have purchased a NetQ (On-site) or Cloud Appliance, refer to Getting started with the Cumulus NetQ Appliance or Getting started with the Cumulus NetQ Cloud Appliance for instructions on installing and configuring the appliance. Then return to this topic for instructions on how to load the NetQ Agent on any switches and hosts you want to monitor.
- If you already have a switch (running Cumulus Linux version 3.3.2 or later) and you want to add NetQ functionality to it, follow the instructions in this topic to:
    - Verify your server meets the hardware and software requirements.
    - Load the software onto the switch.
    - Load the NetQ Agent onto the switches and hosts you want to monitor.
- If you are upgrading from a prior version of NetQ, refer to Upgrade NetQ instead.

Contents

This topic describes...

Prerequisites

Hardware Requirements

NetQ is supported on a variety of hardware.

> ⚠ **IMPORTANT**
>
> You must meet these *minimum* hardware requirements to install the VM and have it run properly.

The NetQ software requires a server with the following:

Hardware Component	Minimum On-site Requirement	Minimum Cloud Requirement
Processor	Eight (8) virtual CPUs	Four (4) virtual CPUs
Memory	64 GB RAM	8 GB RAM
Local disk storage	256 GB SSD (**Note**: This must be an SSD; use of other storage options can lead to system instability and are not supported.)	32 GB (SSD not required)
Network interface speed	1 Gb NIC	1 Gb NIC

You must also open the following ports on your hardware to use the NetQ software:

Port	Deployment Type	Software Component Access
31980	On-site and cloud	NetQ Platform
32708	On-site	API Gateway
32666	On-site	Web-based User Interface

NetQ Platform HyperVisor Requirements

The NetQ Platform can be installed as a Virtual Machine (VM) using one of the following hypervisors:

- VMware ESXi™ 6.5 for servers running Cumulus Linux, CentOS, Ubuntu and RedHat operating systems.
- KVM/QCOW (QEMU Copy on Write) image for servers running CentOS, Ubuntu and RedHat operating systems.

NetQ Agent Operating System Requirements

NetQ 2.2 Agents are supported on the following switch and host operating systems:

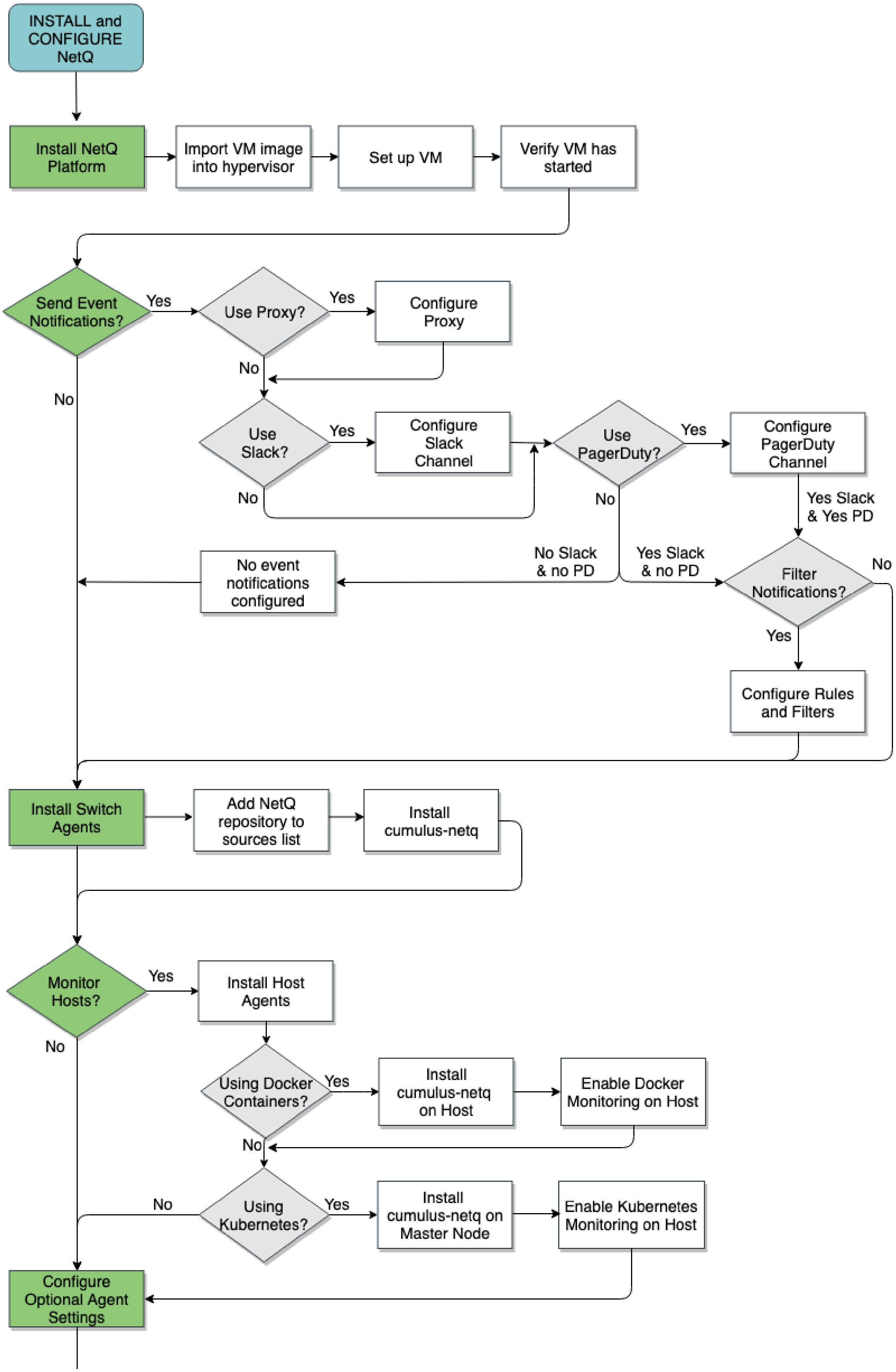
- Cumulus Linux 3.3.2 and later
- Ubuntu 16.04
- Red Hat® Enterprise Linux (RHEL) 7.1
- CentOS 7

NetQ Application Support

The NetQ CLI, UI, and RESTful API are supported on NetQ 2.1.0 and later. NetQ 1.4 and earlier applications are not supported in NetQ 2.x.

Install Workflow

Installation of NetQ involves installing the NetQ software, and installing and configuring the NetQ Agents. Additional steps are needed to Integrate NetQ with Event Notification Applications (see page 52) . This flow chart shows the required steps to install and setup NetQ to start validating your network, and the optional steps of integrating with event notification applications and monitoring hosts.


INSTALL and CONFIGURE NetQ
Install NetQ Platform
Import VM image into hypervisor
Set up VM
Verify VM has started
Send Event Notifications?
Yes
Use Proxy?
Yes
Configure Proxy
No
No
Use Slack?
Yes
Configure Slack Channel
Use PagerDuty?
Yes
Configure PagerDuty Channel
No
No
Yes Slack & Yes PD
No event notifications configured
No Slack & no PD
Yes Slack & no PD
Filter Notifications?
No
Yes
Configure Rules and Filters
Install Switch Agents
Add NetQ repository to sources list
Install cumulus-netq
Monitor Hosts?
Yes
Install Host Agents
No
Using Docker Containers?
Yes
Install cumulus-netq on Host
Enable Docker Monitoring on Host
No
No
Using Kubernetes?
Yes
Install cumulus-netq on Master Node
Enable Kubernetes Monitoring on Host
Configure Optional Agent Settings

Install the NetQ Platform

The first step of the install process is to install the NetQ software onto your hardware (NetQ Platform).

The NetQ software is comprised of the following components:

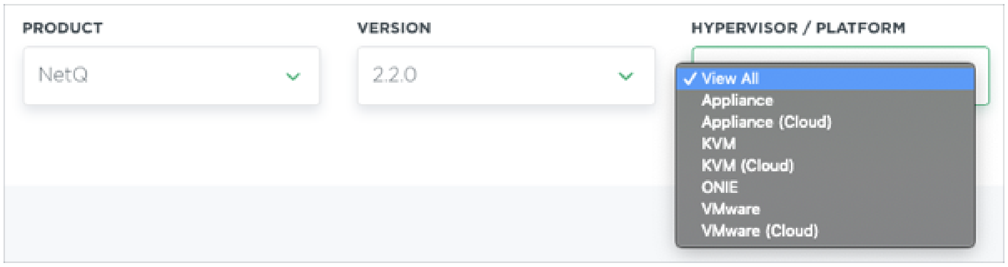
- **NetQ applications**: network monitoring and analytics functionality
- **NetQ CLI**: command line user interface for monitoring network and administering NetQ through a terminal session
- **NetQ UI**: graphical interface for monitoring network and administering NetQ
- **NetQ API**: Restful application programming interface for accessing NetQ data and integrating with third-party tools
- **NetQ notifier**: application used to send event notifications to third-party notification tools

> ### Best Practice
>
> Cumulus Networks recommends you install the NetQ software on a server that is part of an out-of-band management network to ensure it can monitor in-band network issues without being affected itself. You should run the software on a separate, powerful server to ensure proper operation and for maximum usability and performance. Refer to Hardware Requirements (see page 31) for specifics.

Install NetQ VM Image

To install the NetQ Platform software onto your own hardware using a VM image:

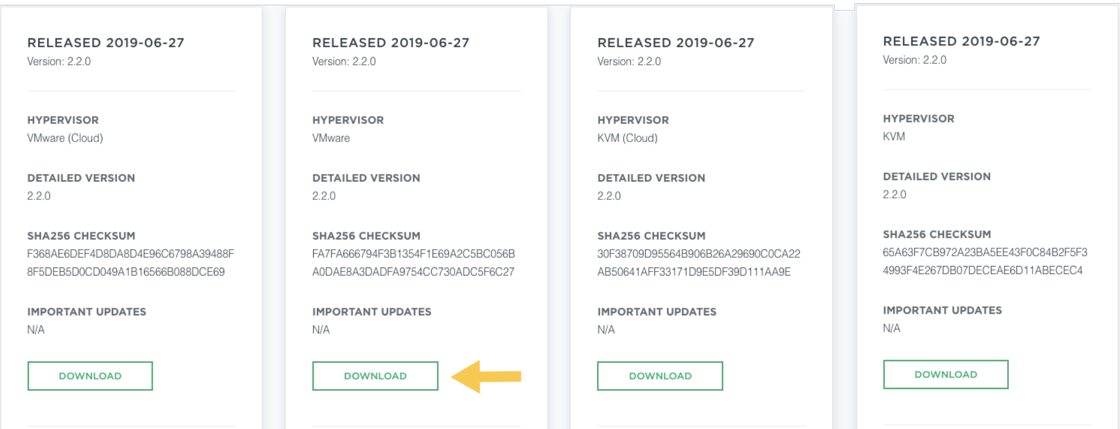
1. **IMPORTANT**: Confirm that your server hardware meets the requirements set out here (see page 31).
2. Download the NetQ Platform image.
   a. On the Cumulus Downloads page, select *NetQ* from the **Product** list box.
   b. Click *2.2* from the **Version** list box, and then select *2.2.x* from the submenu.
   c. Optionally, select the hypervisor you wish to use (*VMware, VMware (Cloud), KVM (Cloud)*, or *KVM*) from the **Hypervisor/Platform** list box.
   Note: You can ignore the ONIE and Appliance options, as they are for the NetQ appliances.


PRODUCT: NetQ

VERSION: 2.2.0

HYPERVISOR / PLATFORM: ✓ View All

d. Scroll down to review the images that match your selection criteria, and click **Download** for the image you want.



RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
VMware (Cloud)

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
F368AE6DEF4D8DA8D4E96C6798A39488F8F5DEB5D0CD049A1B16566B088DCE69

IMPORTANT UPDATES
N/A

DOWNLOAD

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
VMware

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
FA7FA666794F3B1354F1E69A2C5BC056BA0DAE8A3DADFA9754CC730ADC5F6C27

IMPORTANT UPDATES
N/A

DOWNLOAD

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
KVM (Cloud)

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
30F38709D95564B906B26A29690C0CA22AB50641AFF33171D9E5DF39D111AA9E

IMPORTANT UPDATES
N/A

DOWNLOAD

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
KVM

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
65A63F7CB972A23BA5EE43F0C84B2F5F34993F4E267DB07DECEAE6D11ABECEC4

IMPORTANT UPDATES
N/A

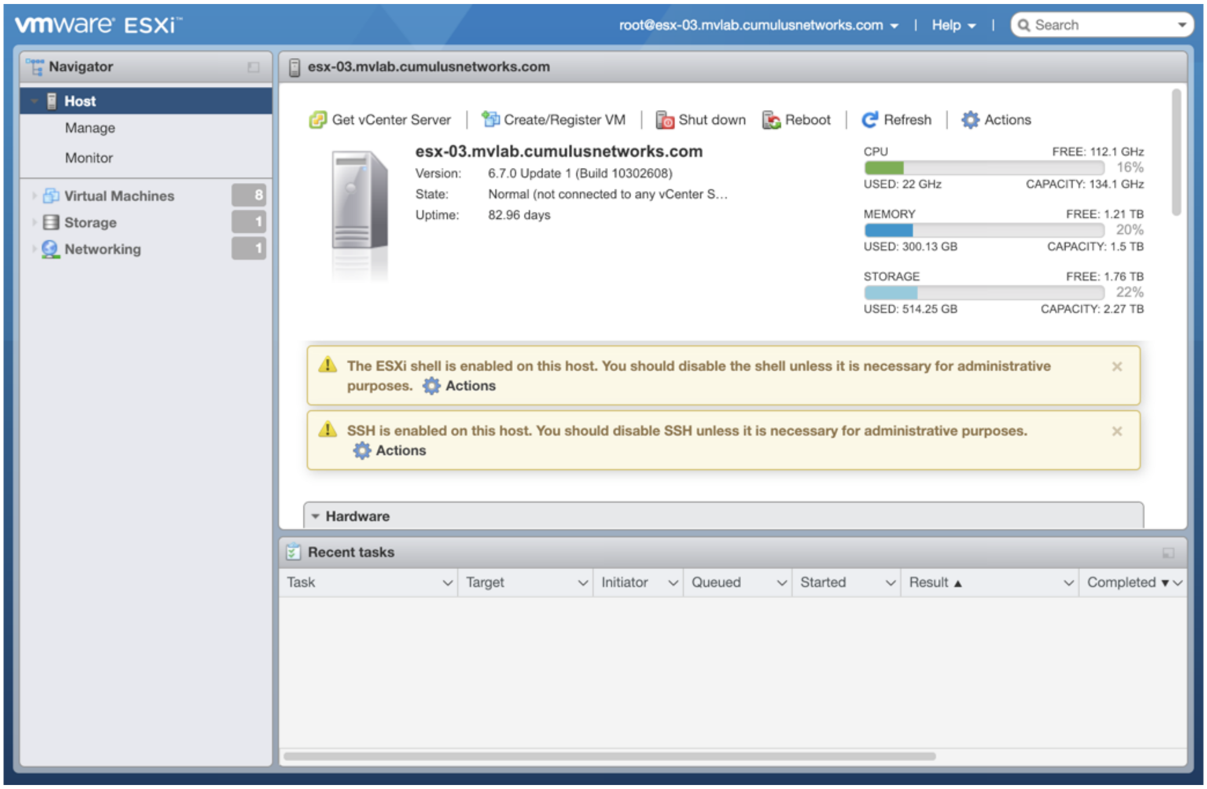
DOWNLOAD

3. Open your hypervisor and set up your VM.
   You can use these examples for reference or use your own hypervisor instructions.

VMware example

This example shows the VM setup process using an OVA file with VMware ESXi.

1. Enter the address of the hardware in your browser.
2. Log in to VMware using credentials with root access.



esx-03.mvlab.cumulusnetworks.com
Version: 6.7.0 Update 1 (Build 10302608)
State: Normal (not connected to any vCenter S…
Uptime: 82.96 days

CPU FREE: 112.1 GHz
16%
USED: 22 GHz CAPACITY: 134.1 GHz

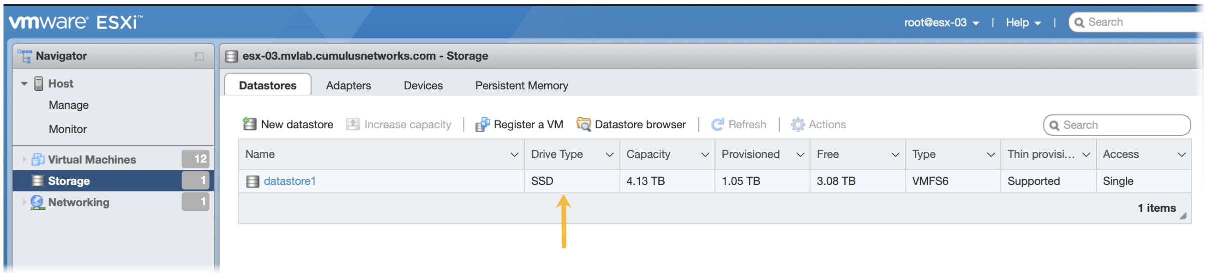
MEMORY FREE: 1.21 TB
20%
USED: 300.13 GB CAPACITY: 1.5 TB

STORAGE FREE: 1.76 TB
22%
USED: 514.25 GB CAPACITY: 2.27 TB

The ESXi shell is enabled on this host. You should disable the shell unless it is necessary for administrative purposes. Actions

SSH is enabled on this host. You should disable SSH unless it is necessary for administrative purposes. Actions

3. For an on-site NetQ Platform deployment, click **Storage** in the Navigator to verify you have an SSD installed.

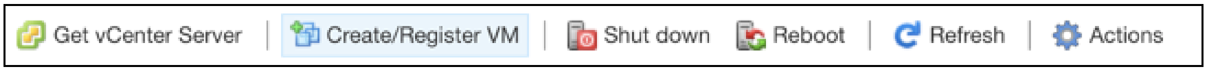


esx-03.mvlab.cumulusnetworks.com - Storage

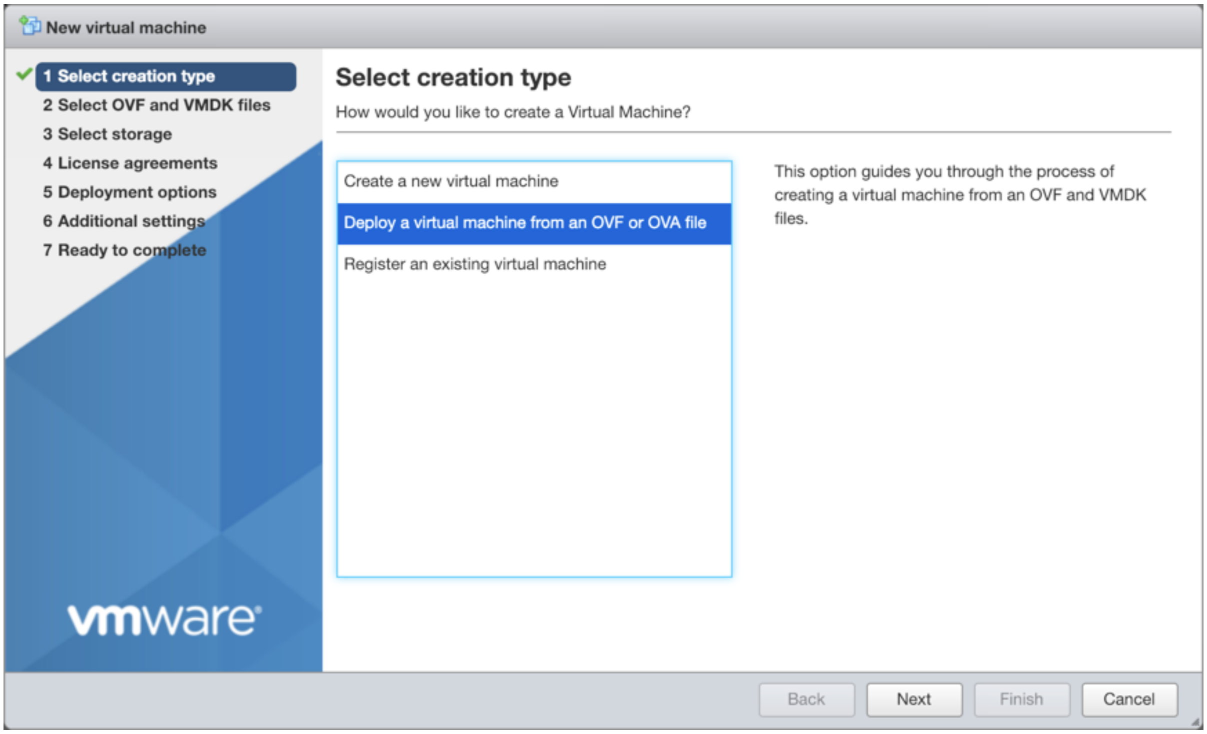
Name	Drive Type	Capacity	Provisioned	Free	Type	Thin provisi...	Access
datastore1	SSD	4.13 TB	1.05 TB	3.08 TB	VMFS6	Supported	Single

1 items

4. Click **Create/Register VM** at the top of the right pane.



5. Select **Deploy a virtual machine from and OVF or OVA file**, and click **Next**.



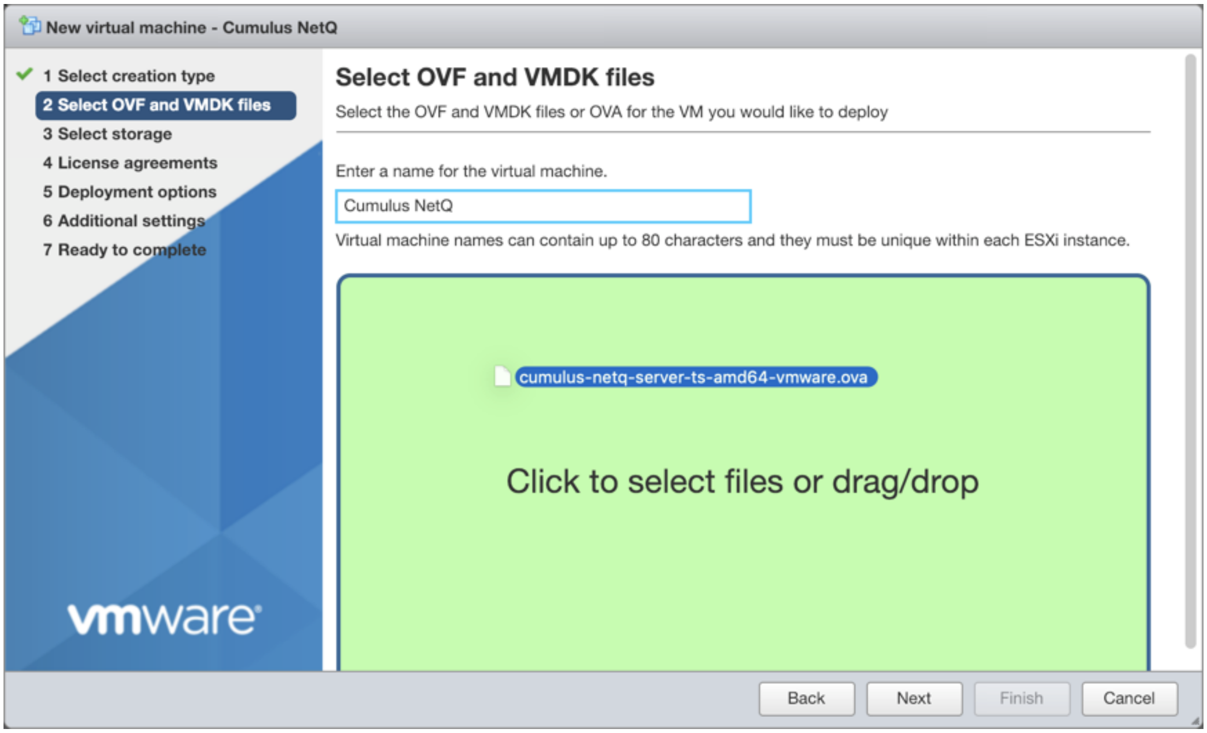
Select creation type

How would you like to create a Virtual Machine?

Create a new virtual machine
Deploy a virtual machine from an OVF or OVA file
Register an existing virtual machine

This option guides you through the process of creating a virtual machine from an OVF and VMDK files.

6. Provide a name for the VM, for example *Cumulus NetQ*.
7. Drag and drop the NetQ Platform image file you downloaded in Step 1 above.
8. Click **Next**.



Select OVF and VMDK files

Select the OVF and VMDK files or OVA for the VM you would like to deploy

Enter a name for the virtual machine.

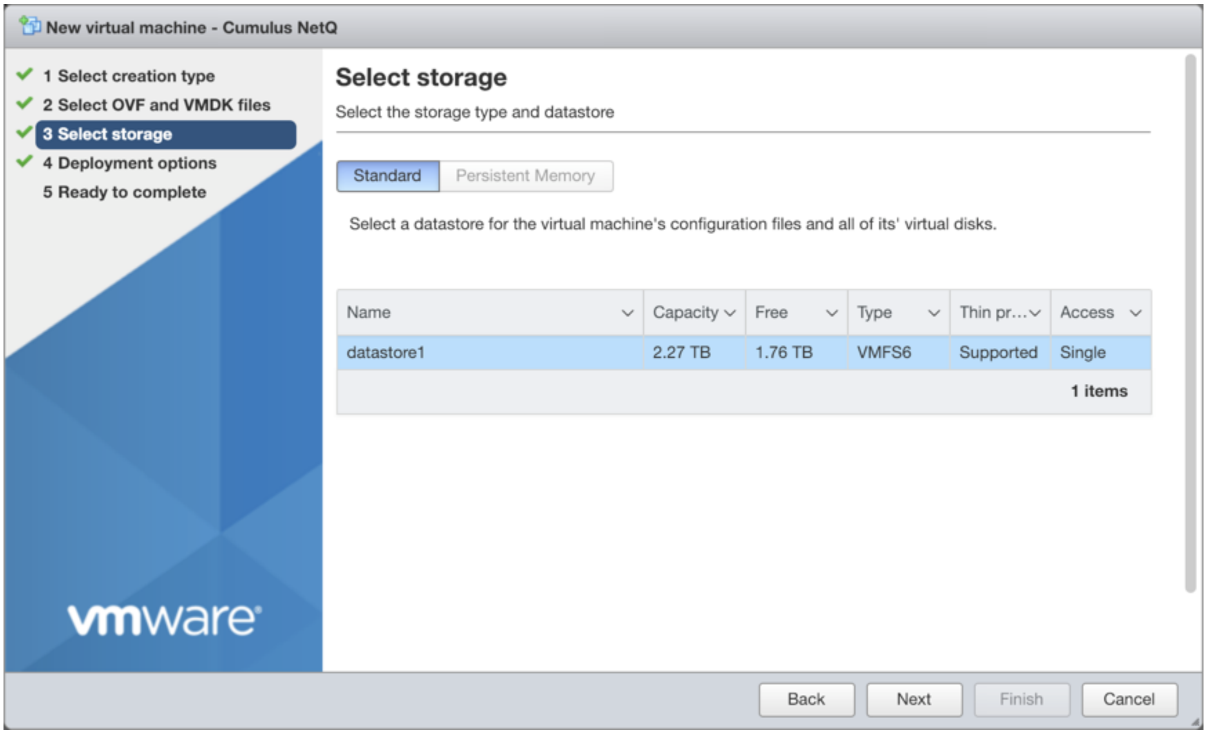
Cumulus NetQ

Virtual machine names can contain up to 80 characters and they must be unique within each ESXi instance.

cumulus-netq-server-ts-amd64-vmware.ova

Click to select files or drag/drop

9. Select the storage type and data store for the image to use, then click **Next**. In this example, only one is available.



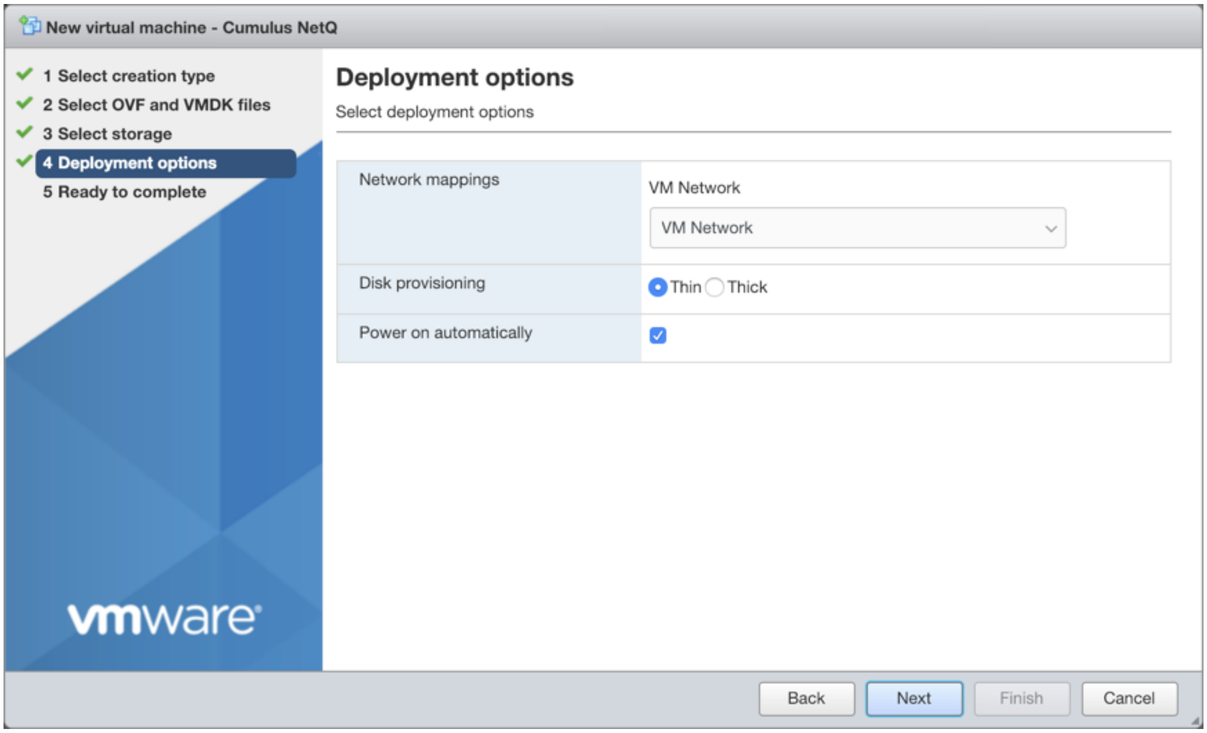
Select storage

Select the storage type and datastore

Select a datastore for the virtual machine's configuration files and all of its' virtual disks.

Name	Capacity	Free	Type	Thin pr...	Access
datastore1	2.27 TB	1.76 TB	VMFS6	Supported	Single
					1 items

10. Accept the default deployment options or modify them according to your network needs. Click **Next** when you are finished.

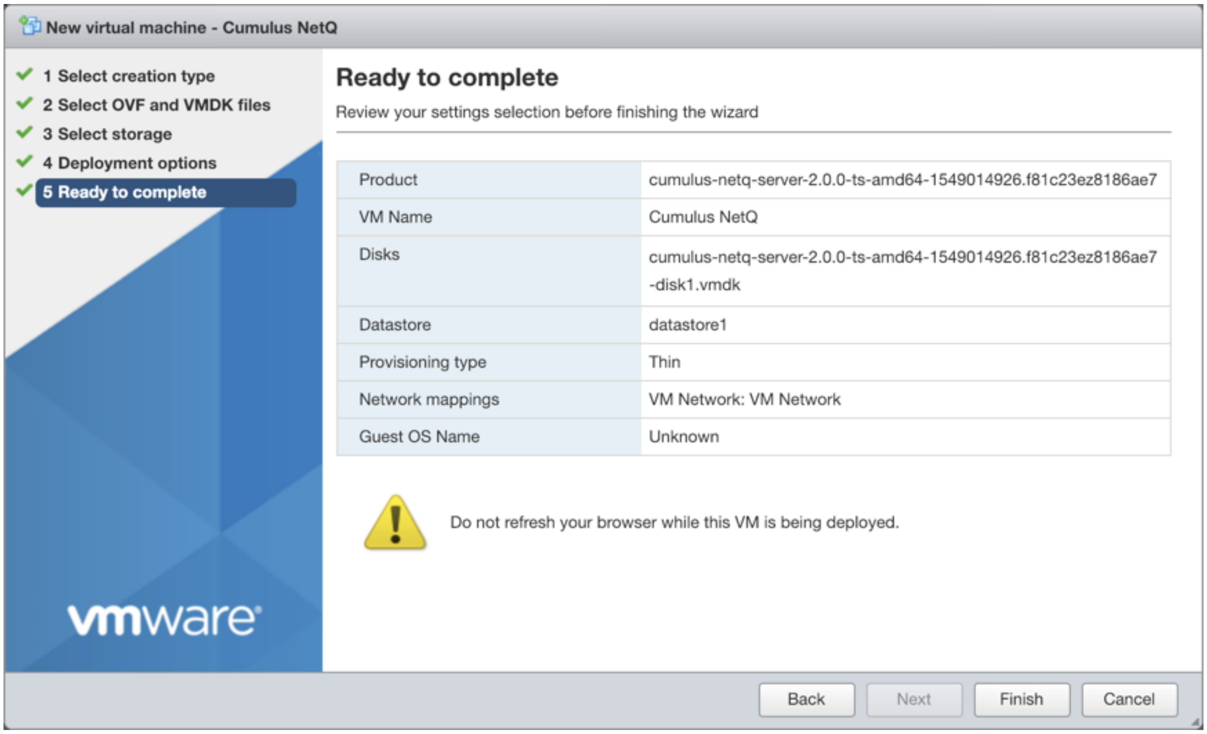


Deployment options

Select deployment options

Network mappings	VM Network VM Network
Disk provisioning	● Thin ○ Thick
Power on automatically	☑

11. Review the configuration summary. Click **Back** to change any of the settings, or click **Finish** to continue with the creation of the VM.



Ready to complete

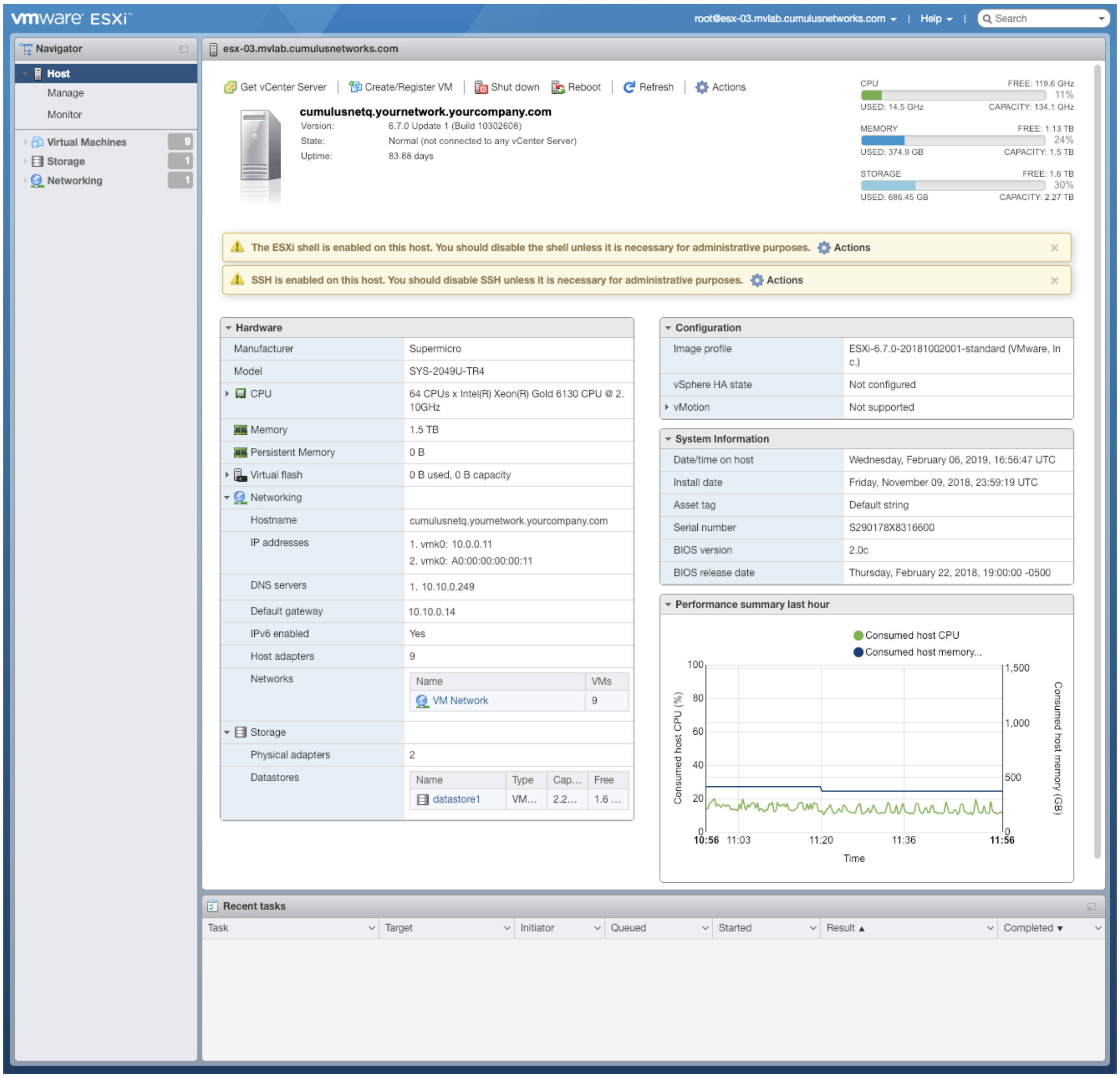
Review your settings selection before finishing the wizard

Product	cumulus-netq-server-2.0.0-ts-amd64-1549014926.f81c23ez8186ae7
VM Name	Cumulus NetQ
Disks	cumulus-netq-server-2.0.0-ts-amd64-1549014926.f81c23ez8186ae7-disk1.vmdk
Datastore	datastore1
Provisioning type	Thin
Network mappings	VM Network: VM Network
Guest OS Name	Unknown

Do not refresh your browser while this VM is being deployed.

The progress of the request is shown in the Recent Tasks window at the bottom of the application. This may take some time, so continue with your other work until the upload finishes.

12. Once completed, view the full details of the VM and hardware.



vmware ESXi
root@esx-03.mvlab.cumulusnetworks.com | Help | Search
Navigator
Host
Manage
Monitor
Virtual Machines 9
Storage 1
Networking 1
esx-03.mvlab.cumulusnetworks.com
Get vCenter Server | Create/Register VM | Shut down | Reboot | Refresh | Actions

cumulusnetq.yournetwork.yourcompany.com

Version: 6.7.0 Update 1 (Build 10302608)
State: Normal (not connected to any vCenter Server)
Uptime: 83.88 days

CPU FREE: 119.6 GHz 11% USED: 14.5 GHz CAPACITY: 134.1 GHz
MEMORY FREE: 1.13 TB 24% USED: 374.9 GB CAPACITY: 1.5 TB
STORAGE FREE: 1.6 TB 30% USED: 686.45 GB CAPACITY: 2.27 TB

The ESXi shell is enabled on this host. You should disable the shell unless it is necessary for administrative purposes. Actions

SSH is enabled on this host. You should disable SSH unless it is necessary for administrative purposes. Actions

Hardware

Manufacturer	Supermicro
Model	SYS-2049U-TR4
CPU	64 CPUs x Intel(R) Xeon(R) Gold 6130 CPU @ 2.10GHz
Memory	1.5 TB
Persistent Memory	0 B
Virtual flash	0 B used, 0 B capacity
Networking	
Hostname	cumulusnetq.yournetwork.yourcompany.com
IP addresses	1. vmk0: 10.0.0.11 2. vmk0: A0:00:00:00:00:11
DNS servers	1. 10.10.0.249
Default gateway	10.10.0.14
IPv6 enabled	Yes
Host adapters	9
Networks	Name: VM Network VMs: 9
Storage	
Physical adapters	2
Datastores	Name: datastore1 Type: VM... Cap...: 2.2... Free: 1.6 ...

Configuration

Image profile	ESXi-6.7.0-20181002001-standard (VMware, Inc.)
vSphere HA state	Not configured
vMotion	Not supported

System Information

Date/time on host	Wednesday, February 06, 2019, 16:56:47 UTC
Install date	Friday, November 09, 2018, 23:59:19 UTC
Asset tag	Default string
Serial number	S290178X8316600
BIOS version	2.0c
BIOS release date	Thursday, February 22, 2018, 19:00:00 -0500

Performance summary last hour

KVM example

This example shows the VM setup process for a system with Libvirt and KVM/QEMU installed.

1. Confirm that the SHA256 checksum matches the one posted on the Cumulus Downloads website to ensure the image download has not been corrupted.

```
$ sha256sum ./Downloads/cumulus-netq-server-2.2.0-ts-amd64-qemu.
qcow2
$
6fff5f2ac62930799b4e8cc7811abb6840b247e2c9e76ea9ccba03f991f42424
./Downloads/cumulus-netq-server-2.2.0-ts-amd64-qemu.qcow2
```

2. Copy the QCOW2 image to a directory where you want to run it.

> Copy, instead of moving, the original QCOW2 image that was downloaded to avoid re-downloading it again later should you need to perform this process again.

```
$ sudo mkdir /vms
$ sudo cp ./Downloads/cumulus-netq-server-2.2.0-ts-amd64-qemu.
qcow2 /vms/ts.qcow2
```

3. Create the VM.

   For a Direct VM, where the VM uses a MACVLAN interface to sit on the host interface for its connectivity:

   ```
   $ virt-install --name=netq_ts --vcpus=8 --memory=65536 --os-
   type=linux --os-variant=debian7 \
    --disk path=/vms/ts.qcow2,format=qcow2,bus=virtio,cache=none \
    --network=type=direct,source=eth0,model=virtio --import --
   noautoconsole
   ```

   > Replace the disk path value with the location where the QCOW2 image is to reside. Replace network model value (eth0 in the above example) with the name of the interface where the VM is connected to the external network.

   Or, for a Bridged VM, where the VM attaches to a bridge which has already been setup to allow for external access:

   ```
   $ virt-install --name=netq_ts --vcpus=8 --memory=65536 --os-
   type=linux --os-variant=debian7 \
    --disk path=/vms/ts.qcow2,format=qcow2,bus=virtio,cache=none \
    --network=bridge=br0,model=virtio --import --noautoconsole
   ```

   > Replace network bridge value (br0 in the above example) with the name of the (pre-existing) bridge interface where the VM is connected to the external network.

4. Watch the boot process in another terminal window.

   ```
   $ virsh console netq_ts
   ```

5. From the Console of the VM, check to see which IP address Eth0 has obtained via DHCP, or alternatively set a static IP address with NCLU on the NetQ Appliance or Platform VM.

   ```
   $ ip addr show eth0
   ```

```
$ net add interface eth0 ip address 10.0.0.1
$ net commit
```

⚠ If you have changed the IP Address of the NetQ Platform, you need to re-register this address with the Kubernetes containers before you can continue.

1. Reset all Kubernetes administrative settings. Run the command twice to make sure all directories and files have been reset.

   ```
   cumulus@netq-platform:~$ sudo kubeadm reset -f
   cumulus@netq-platform:~$ sudo kubeadm reset -f
   ```

2. Remove the Kubernetes configuration.
   `cumulus@netq-platform:~$ sudo rm /home/cumulus/.kube/config`
3. Reset the NetQ Platform install daemon.
   `cumulus@netq-platform:~$ sudo systemctl reset-failed`
4. Reset the Kubernetes service.
   `cumulus@netq-platform:~$ sudo systemctl restart cts-kubectl-config`
   Note: *Allow 15 minutes for the prompt to return.*
5. Reboot the VM.
   Note: *Allow 5-10 minutes for the VM to boot.*

Verify the Installation

1. Verify you can access the NetQ CLI.
   a. From a terminal window, log in to the NetQ Platform using the default credentials (*cumulus /CumulusLinux!*).

```
<computer>:~<username>$ ssh cumulus@<netq-platform-ipaddress>
Warning: Permanently added '<netq-platform-hostname>,
192.168.1.254' (ECDSA) to the list of known hosts.
cumulus@<netq-platform-hostname>'s password: <enter
CumulusLinux! here>

Welcome to Cumulus (R) Linux (R)

For support and online technical documentation, visit
http://www.cumulusnetworks.com/support

The registered trademark Linux (R) is used pursuant to a
sublicense from LMI,
the exclusive licensee of Linus Torvalds, owner of the mark
on a world-wide
basis.

cumulus@<netq-platform-hostname>:~$
```

b. Run the following command to verify all applications are operating properly. ***Note***: *Please allow 10-15 minutes for all applications to come up and report their status.*

```
cumulus@<netq-platform-hostname>:~$ netq show opta-health
Application                    Status    Health    Kafka
Stream    Git Hash    Timestamp
-----------------------------  --------  --------
--------------  ----------  ------------------------
netq-app-macfdb                UP        true
up              14b42e6     Mon Jun  3 20:20:35 2019
netq-app-interface             UP
true                      0fe11c6     Mon Jun  3 20:20:34
2019
netq-app-vlan                  UP
true                      4daed85     Mon Jun  3 20:20:35
2019
netq-app-sensors               UP        true
up              f37272c     Mon Jun  3 20:20:34 2019
netq-app-topology              UP
true                      3f4a887     Mon Jun  3 20:20:34
2019
kafka-broker
UP                                              Mon Jun  3
20:20:35 2019
netq-app-mstpinfo              UP        true
up              ef5565d     Mon Jun  3 20:20:35 2019
netq-app-address               UP        true
up              7e0d03d     Mon Jun  3 20:20:35 2019
netq-gui
UP                                              Mon Jun  3
20:20:35 2019
netq-app-kube                  UP        true
up              fbcaa9d     Mon Jun  3 20:20:34 2019
netq-app-link                  UP        true
up              6c2b21a     Mon Jun  3 20:20:35 2019
netq-app-ptm                   UP        true
up              7162771     Mon Jun  3 20:20:34 2019
netq-opta                      UP
true                                  Mon Jun  3 20:20:34
2019
netq-app-clagsession           UP        true
up              356dda9     Mon Jun  3 20:20:34 2019
netq-endpoint-gateway          UP
true                      295e9ed     Mon Jun  3 20:20:34
2019
netq-app-ospf                  UP        true
up              e0e2ab0     Mon Jun  3 20:20:34 2019
netq-app-lldp                  UP        true
up              90582de     Mon Jun  3 20:20:35 2019
```

```
netq-app-inventory             UP        true
up              bbf9938     Mon Jun  3 20:20:34 2019
netq-app-tracecheck-scheduler  UP
true                      5484c68     Mon Jun  3 20:20:34
2019
netq-app-infra                 UP        true
up              13f9e7c     Mon Jun  3 20:20:34 2019
kafka-connect
UP                                              Mon Jun  3
20:20:35 2019
netq-app-search                UP        true
up              e47aaba     Mon Jun  3 20:20:34 2019
netq-app-procdevstats          UP        true
up              b8e280e     Mon Jun  3 20:20:34 2019
netq-app-vxlan                 UP        true
up              123c577     Mon Jun  3 20:20:34 2019
zookeeper
UP                                              Mon Jun  3
20:20:35 2019
netq-app-resource-util         UP        true
up              41dfb07     Mon Jun  3 20:20:34 2019
netq-app-evpn                  UP        true
up              05a4003     Mon Jun  3 20:20:34 2019
netq-api-gateway               UP
true                      c40231a     Mon Jun  3 20:20:34
2019
netq-app-port                  UP        true
up              4592b70     Mon Jun  3 20:20:35 2019
netq-app-macs                  UP
true                      dd6cd96     Mon Jun  3 20:20:35
2019
netq-app-notifier              UP        true
up              da57b69     Mon Jun  3 20:20:35 2019
netq-app-events                UP        true
up              8f7b4d9     Mon Jun  3 20:20:34 2019
netq-app-services              UP        true
up              5094f4a     Mon Jun  3 20:20:34 2019
cassandra
UP                                              Mon Jun  3
20:20:35 2019
netq-app-configdiff            UP        true
up              3be2ef1     Mon Jun  3 20:20:34 2019
netq-app-neighbor              UP        true
up              9ebe479     Mon Jun  3 20:20:35 2019
netq-app-bgp                   UP        true
up              e68f7a8     Mon Jun  3 20:20:35 2019
schema-registry
UP                                              Mon Jun  3
20:20:35 2019
netq-app-lnv                   UP        true
up              a9ca80a     Mon Jun  3 20:20:34 2019
```

```
netq-app-healthdashboard       UP
true                      eea044c     Mon Jun  3 20:20:34
2019
netq-app-ntp                   UP        true
up              651c86f     Mon Jun  3 20:20:35 2019
netq-app-customermgmt          UP
true                      7250354     Mon Jun  3 20:20:34
2019
netq-app-node                  UP        true
up              f676c9a     Mon Jun  3 20:20:34 2019
netq-app-route                 UP        true
up              6e31f98     Mon Jun  3 20:20:35 2019

cumulus@<netq-platform-hostname>:~$
```

> ⓘ If any of the applications or services display Status as DOWN after 30 minutes, open a support ticket and attach the output of the `opta-support` command.

2. Verify that NTP is configured and running. NTP operation is critical to proper operation of NetQ. Refer to Setting Date and Time in the *Cumulus Linux User Guide* for details and instructions.
3. Continue the NetQ installation by loading the NetQ Agent on each switch or host you want to monitor. Refer to Install NetQ Agent (see page 44) for instructions.

Install the NetQ Agent

Whether using the NetQ Appliance or your own hardware, the NetQ Agent must be installed on each node you want to monitor. The node can be a:

- Switch running Cumulus Linux version 3.3.2 or later
- Server running Red Hat RHEL 7.1, Ubuntu 16.04 or CentOS 7
- Linux virtual machine running any of the above Linux operating systems

To install the NetQ Agent you need to install the OS-specific meta package, `cumulus-netq`, on each switch. Optionally, you can install it on hosts. The meta package contains the NetQ Agent, the NetQ command line interface (CLI), and the NetQ library. The library contains modules used by both the NetQ Agent and the CLI.

Instructions for installing the meta package on each node type are included here:

- Install NetQ Agent on a Cumulus Linux Switch (see page 45)
- Install NetQ Agent on an Ubuntu Server (see page 46)
- Install NetQ Agent on a Red Hat or CentOS Server (see page 49)

> ⓘ If your network uses a proxy server for external connections, you should first configure a global proxy so `apt-get` can access the meta package on the Cumulus Networks repository.

Install NetQ Agent on a Cumulus Linux Switch

A simple process installs the NetQ Agent on a Cumulus switch.

1. Edit the `/etc/apt/sources.list` file to add the repository for Cumulus NetQ. ***Note** that NetQ has a separate repository from Cumulus Linux.*

```
cumulus@switch:~$ sudo nano /etc/apt/sources.list
...
deb http://apps3.cumulusnetworks.com/repos/deb CumulusLinux-3
netq-2.1
...
```

> The repository `deb http://apps3.cumulusnetworks.com/repos/deb CumulusLinux-3 netq-latest` can be used if you want to always retrieve the latest posted version of NetQ.

2. Update the local `apt` repository, then install the NetQ meta package on the switch.

```
cumulus@switch:~$ sudo apt-get update
cumulus@switch:~$ sudo apt-get install cumulus-netq
```

3. Verify that NTP is running on the host node. Nodes must be in time synchronization with the NetQ Platform to enable useful statistical analysis.

```
cumulus@switch:~$ sudo systemctl status ntp
[sudo] password for cumulus:
 ntp.service - LSB: Start NTP daemon
   Loaded: loaded (/etc/init.d/ntp; bad; vendor preset: enabled)
   Active: active (running) since Fri 2018-06-01 13:49:11 EDT; 2
weeks 6 days ago
     Docs: man:systemd-sysv-generator(8)
   CGroup: /system.slice/ntp.service
           2873 /usr/sbin/ntpd -p /var/run/ntpd.pid -g -c /var
/lib/ntp/ntp.conf.dhcp -u 109:114
```

4. Restart `rsyslog` so log files are sent to the correct destination.

```
cumulus@switch:~$ sudo systemctl restart rsyslog.service
```

5. Configure the NetQ Agent to send telemetry data to the NetQ Platform, NetQ Appliance, or NetQ Cloud Appliance.
Note: If you intend to use VRF, skip to Configure the Agent to Use VRF (see page 52). If you intend

to specify a port for communication, skip to Configure the Agent to Communicate over a Specific Port (see page 52).
In this example, the IP address for the NetQ hardware is *192.168.1.254*.

```
cumulus@switch:~$ netq config add agent server 192.168.1.254
cumulus@switch:~$ netq config restart agent
```

6. Optionally, configure the switch or host to run the NetQ CLI.

- For NetQ Platform or NetQ Appliance:

```
cumulus@switch:~$ netq config add cli server 192.168.1.254
cumulus@switch:~$ netq config restart cli
```

- For NetQ Cloud Appliance:

```
cumulus@switch:~$ netq config add cli server <api-url> access-
key <user-access-key> secret-key <user-secret-key> port 443
cumulus@switch:~$ netq config restart cli
```

> The switch or host must have access to the Internet to configure CLI access.

Repeat these steps for each Cumulus switch, or use an automation tool to install NetQ Agent on multiple Cumulus Linux switches.

Install NetQ Agent on an Ubuntu Server (Optional)

Before you install the NetQ Agent on an Ubuntu server, make sure the following packages are installed and running these minimum versions:

- iproute 1:4.3.0-1ubuntu3.16.04.1 all
- iproute2 4.3.0-1ubuntu3 amd64
- lldpd 0.7.19-1 amd64
- ntp 1:4.2.8p4+dfsg-3ubuntu5.6 amd64

> Make sure you are running lldp**d**, not lldp**ad**. Ubuntu does not include `lldpd` by default, which is required for the installation. To install this package, run the following commands:
>
> ```
> root@ubuntu:~# apt-get update
> root@ubuntu:~# apt-get install lldpd
> root@ubuntu:~# systemctl enable lldpd.service
> root@ubuntu:~# systemctl start lldpd.service
> ```

To install the NetQ Agent on an Ubuntu server:

1. Reference and update the local `apt` repository.

   ```
   root@ubuntu:~# wget -O- https://apps3.cumulusnetworks.com/setup
   /cumulus-apps-deb.pubkey | apt-key add -
   ```

2. Create the file `/etc/apt/sources.list.d/cumulus-host-ubuntu-xenial.list` and add the following lines:

   ```
   root@ubuntu:~# vi /etc/apt/sources.list.d/cumulus-apps-deb-
   xenial.list
   ...
   deb [arch=amd64] https://apps3.cumulusnetworks.com/repos/deb
   xenial netq-latest
   ...
   ```

   > ⚠ The use of `netq-latest` in this example means that a `get` to the repository always retrieves the latest version of NetQ, even in the case where a major version update has been made. If you want to keep the repository on a specific version — such as `netq-2.2` — use that instead.

3. Install NTP on the server, if not already installed.

   ```
   root@ubuntu:~# sudo apt-get install ntp
   ```

4. Configure the NTP server.
   a. Open the `/etc/ntp.conf` file in your text editor of choice.
   b. Under the Server section, specify the NTP server IP address or hostname.

5. Enable and start the NTP service.

   ```
   root@ubuntu:~# sudo systemctl enable ntp.service
   root@ubuntu:~# sudo systemctl start ntp.service
   ```

6. Verify NTP is operating correctly. Look for an asterisk (*) or a plus sign (+) that indicates the clock is synchronized.

   ```
   root@ubuntu:~# ntpq -pn
        remote           refid      st t when poll reach   delay
   offset  jitter
   ```

```
=================================================================
=============
+173.255.206.154 132.163.96.3     2 u   86  128  377   41.354
2.834   0.602
+12.167.151.2    198.148.79.209   3 u  103  128  377   13.395
-4.025   0.198
 2a00:7600::41   .STEP.          16 u    - 1024    0    0.000
0.000   0.000
*129.250.35.250  249.224.99.213   2 u  101  128  377   14.588
-0.299   0.243
```

7. Install the meta package on the server.

```
root@ubuntu:~# apt-get update
root@ubuntu:~# apt-get install cumulus-netq
```

8. Configure the NetQ Agent to send telemetry data to the NetQ Platform, NetQ Appliance, or NetQ Cloud Appliance.
Note: If you intend to use VRF, skip to Configure the Agent to Use VRF (see page 52). If you intend to specify a port for communication, skip to Configure the Agent to Communicate over a Specific Port (see page 52).
In this example, the IP address for the NetQ hardware is *192.168.1.254*.

```
root@ubuntu:~# netq config add agent server 192.168.1.254
Updated agent server 192.168.1.254 vrf default. Please restart
netq-agent (netq config restart agent).
root@ubuntu:~# netq config restart agent
```

9. Optionally, configure the switch or host to run the NetQ CLI.
   - For NetQ Platform or NetQ Appliance:

   ```
   root@ubuntu:~# netq config add cli server 192.168.1.254
   Updated cli server 192.168.1.254 vrf default. Please
   restart netqd (netq config restart cli).
   root@ubuntu:~# netq config restart cli
   ```

   - For NetQ Cloud Appliance:

   ```
   root@ubuntu:~# netq config add cli server <api-url> access-
   key <user-access-key> secret-key <user-secret-key> port 443
   root@ubuntu:~# netq config restart cli
   ```

   ⓘ The switch or host must have access to the Internet to configure CLI access.

10. Repeat these steps for all of your hosts running Ubuntu, or use an automation tool to streamline the process.

Install NetQ Agent on a Red Hat or CentOS Server (Optional)

Before you install the NetQ Agent on a Red Hat or CentOS server, make sure the following packages are installed and running these minimum versions:

- iproute-3.10.0-54.el7_2.1.x86_64
- lldpd-0.9.7-5.el7.x86_64

> Make sure you are running lldp**d**, not lldp**ad**.
>
> CentOS does not include `lldpd` by default, nor does it include `wget`, which is required for the installation. To install this package, run the following commands:
>
> ```
> root@rhel7:~# yum -y install epel-release
> root@rhel7:~# yum -y install lldpd
> root@rhel7:~# systemctl enable lldpd.service
> root@rhel7:~# systemctl start lldpd.service
> root@rhel7:~# yum install wget
> ```

- ntp-4.2.6p5-25.el7.centos.2.x86_64
- ntpdate-4.2.6p5-25.el7.centos.2.x86_64

To install the NetQ Agent on a Red Hat or CentOS server:

1. Reference and update the local `yum` repository.

```
root@rhel7:~# rpm --import https://apps3.cumulusnetworks.com
/setup/cumulus-apps-rpm.pubkey
root@rhel7:~# wget -O- https://apps3.cumulusnetworks.com/setup
/cumulus-apps-rpm-el7.repo > /etc/yum.repos.d/cumulus-host-el.
repo
```

2. Edit `/etc/yum.repos.d/cumulus-host-el.repo` to set the `enabled=1` flag for the two NetQ repositories.

```
root@rhel7:~# vi /etc/yum.repos.d/cumulus-host-el.repo
...
[cumulus-arch-netq-2.2]
name=Cumulus netq packages
baseurl=https://apps3.cumulusnetworks.com/repos/rpm/el/7/netq-2.2
/$basearch
gpgcheck=1
enabled=1
[cumulus-noarch-netq-2.2]
```

```
name=Cumulus netq architecture-independent packages
baseurl=https://apps3.cumulusnetworks.com/repos/rpm/el/7/netq-2.2
/noarch
gpgcheck=1
enabled=1
...
```

3. Install NTP on the server.

```
root@rhel7:~# yum install ntp
```

4. Configure the NTP server.
    a. Open the `/etc/ntp.conf` file in your text editor of choice.
    b. Under the Server section, specify the NTP server IP address or hostname.
5. Enable and start the NTP service.

```
root@rhel7:~# sudo systemctl enable ntpd.service
root@rhel7:~# sudo systemctl start ntpd.service
```

6. Verify NTP is operating correctly. Look for an asterisk (*) or a plus sign (+) that indicates the clock is synchronized.

```
root@rhel7:~# ntpq -pn
     remote           refid      st t when poll reach   delay
offset  jitter
=================================================================
=============
+173.255.206.154 132.163.96.3     2 u   86  128  377   41.354
2.834   0.602
+12.167.151.2    198.148.79.209   3 u  103  128  377   13.395
-4.025   0.198
 2a00:7600::41   .STEP.          16 u    - 1024    0    0.000
0.000   0.000
*129.250.35.250  249.224.99.213   2 u  101  128  377   14.588
-0.299   0.243
```

7. Install the Bash completion and NetQ meta packages on the server.

```
root@rhel7:~# yum -y install bash-completion
root@rhel7:~# yum install cumulus-netq
```

8. Configure the NetQ Agent to send telemetry data to the NetQ Platform, NetQ Appliance, or NetQ Cloud Appliance.
   Note: If you intend to use VRF, skip to Configure the Agent to Use VRF (see page 52). If you intend to specify a port for communication, skip to Configure the Agent to Communicate over a Specific Port (see page 52).
   In this example, the IP address for the NetQ hardware is *192.168.1.254*.

   ```
   root@rhel7:~# netq config add agent server 192.168.1.254
   Updated agent server 192.168.1.254 vrf default. Please restart
   netq-agent (netq config restart agent).
   root@rhel7:~# netq config restart agent
   ```

9. Optionally, configure the switch or host to run the NetQ CLI.
   a. For NetQ Platform or NetQ Appliance:

   ```
   root@rhel7:~# netq config add cli server 192.168.1.254
   Updated cli server 192.168.1.254 vrf default. Please restart
   netqd (netq config restart cli).
   root@rhel7:~# netq config restart cli
   ```

   b. For NetQ Cloud Appliance:

   ```
   root@rhel7:~# netq config add cli server <api-url> access-
   key <user-access-key> secret-key <user-secret-key> port 443
   root@rhel7:~# netq config restart cli
   ```

   > ⓘ The switch or host must have access to the Internet to configure CLI access.

10. Repeat these steps for all of your hosts running Ubuntu, or use an automation tool to streamline the process.

Configure Optional NetQ Agent Settings

Once the NetQ Agents have been installed on the network nodes you want to monitor, the NetQ Agents must be configured to obtain useful and relevant data. The code examples shown in this section illustrate how to configure the NetQ Agent on a Cumulus switch, but it is exactly the same for the other type of nodes. Depending on your deployment, follow the relevant additional instructions after the basic configuration steps:

- Configuring the Agent to Use a VRF (see page 52)
- Configuring the Agent to Communicate over a Specific Port (see page 52)

Configure the Agent to Use a VRF

While optional, Cumulus strongly recommends that you configure NetQ Agents to communicate with the NetQ Platform only via a VRF, including a management VRF. To do so, you need to specify the VRF name when configuring the NetQ Agent. For example, if the management VRF is configured and you want the agent to communicate with the NetQ Platform over it, configure the agent like this:

```
cumulus@leaf01:~$ netq config add agent server 192.168.1.254 vrf mgmt
cumulus@leaf01:~$ netq config add cli server 192.168.254 vrf mgmt
```

You then restart the agent:

```
cumulus@leaf01:~$ netq config restart agent
cumulus@leaf01:~$ netq config restart cli
```

Configure the Agent to Communicate over a Specific Port

By default, NetQ uses port 31980 for communication between the NetQ Platform and NetQ Agents. If you want the NetQ Agent to communicate with the NetQ Platform via a different port, you need to specify the port number when configuring the NetQ Agent like this:

```
cumulus@leaf01:~$ netq config add agent server 192.168.1.254 port 7379
```

You then restart the agent:

```
cumulus@leaf01:~$ netq config restart agent
```

Integrate with Event Notification Tools

If you want to proactively monitor events in your network, you can integrate NetQ with the PagerDuty or Slack notification tools. To do so you need to configure both the notification application itself to receive the messages, and NetQ with what messages to send and where to send them. Refer to Integrate NetQ with Event Notification Applications (see page 52) to use the CLI for configuration.

Set Up Security

When you set up and configured your Cumulus Linux switches, you likely configured a number of the security features available. Cumulus recommends the same security measures be followed for the NetQ Platform in the out-of-band-network. Refer to the Securing Cumulus Linux white paper for details.

Your Cumulus Linux switches have a number of ports open by default. A few additional ports must be opened to run the NetQ software (refer to Default Open Ports in Cumulus Linux and NetQ article).

Integrate with Third-party Software and Hardware

After you have installed NetQ applications package and the NetQ Agents, you may want to configure some of the additional capabilities that NetQ offers. This topic describes how to install, setup, and configure these capabilities.

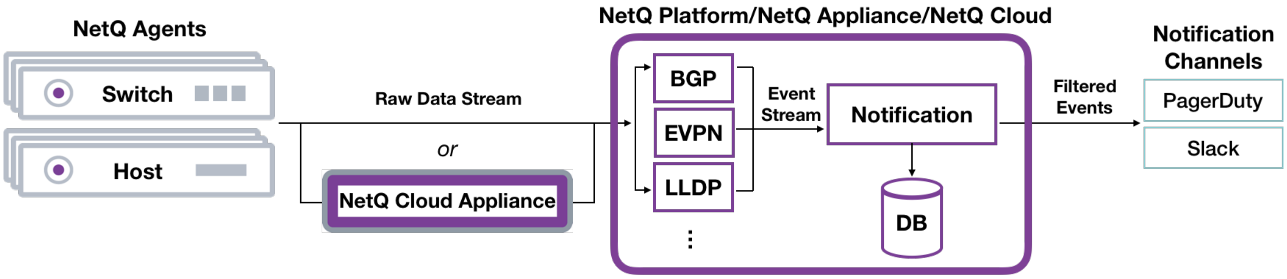
Contents

This topic describes how to...

Integrate NetQ with an Event Notification Application

To take advantage of the numerous event messages generated and processed by NetQ, you must integrate with third-party event notification applications. You can integrate NetQ with the PagerDuty and Slack tools. You may integrate with one or both of these applications.

Each network protocol and service in the NetQ Platform receives the raw data stream from the NetQ Agents, processes the data and delivers events to the Notification function. Notification then stores, filters and sends messages to any configured notification applications. Filters are based on rules you create. You must have at least one rule per filter.



> You may choose to implement a proxy server (that sits between the NetQ Platform and the integration channels) that receives, processes and distributes the notifications rather than having them sent directly to the integration channel. If you use such a proxy, you must configure NetQ with the proxy information.

In either case, notifications are generated for the following types of events:

- Network Protocols
  - BGP status and session state
  - CLAG (MLAG) status and session state
  - EVPN status and session state
  - LLDP status
  - LNV status and session state *
  - OSFP status and session state *
  - VLAN status and session state *
  - VXLAN status and session state *
- Interfaces
  - Link status
  - Ports and cables status
- Services status
  - NetQ Agent status
  - PTM
  - SSH *
  - NTP status *

- Trace status
- Sensors
    - Fan status
    - PSU (power supply unit) status
    - Temperature status
- System
    - Configuration File changes
    - Cumulus Linux License status *
    - Cumulus Linux Support status

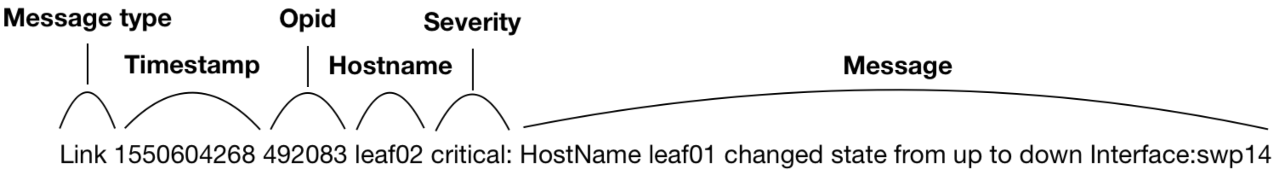
** This type of event can only be viewed in the CLI with this release.*

Event Message Format

Messages have the following structure: `<message-type><timestamp><opid><hostname><severity><message>`

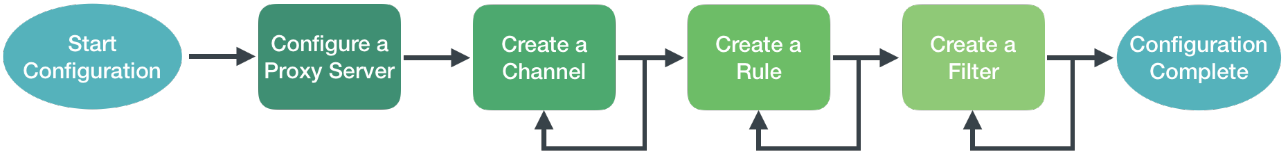
Element	Description
message type	Category of event; *bgp, clag, configdiff, evpn, link, lldp, lnv, node, ntp, ospf, port, sensor, services, trace, vlan or vxlan*
timestamp	Date and time event occurred
opid	Identifier of the service or process that generated the event
hostname	Hostname of network device where event occurred
severity	Severity level in which the given event is classified; *debug*, *error*, *info*, *warning*, or *critical*
message	Text description of event

For example:



```
Link 1550604268 492083 leaf02 critical: HostName leaf01 changed state from up to down Interface:swp14
```

To set up the integrations, you must configure NetQ with at least one channel. Optionally, you can define rules and filters to refine what messages you want to view and where to send them. You can also configure a proxy server to receive, process, and forward the messages. This is accomplished using the NetQ CLI in the following order:



Notification Commands Overview

The NetQ Command Line Interface (CLI) is used to filter and send notifications to third-party tools based on severity, service, event-type, and device. You can use TAB completion or the `help` keyword to assist when needed. The command syntax is:

```
##Proxy
netq add notification proxy <text-proxy-hostname> [port <text-proxy-port>]
netq show notification proxy
netq del notification proxy

##Channels
netq add notification channel slack <text-channel-name> webhook <text-webhook-url> [severity info|severity warning|severity error|severity debug] [tag <text-slack-tag>]
netq add notification channel pagerduty <text-channel-name> integration-key <text-integration-key> [severity info|severity warning|severity error|severity debug]

##Rules and Filters
netq add notification rule <text-rule-name> key <text-rule-key> value <text-rule-value>
netq add notification filter <text-filter-name> [severity info|severity warning|severity error|severity debug] [rule <text-rule-name-anchor>] [channel <text-channel-name-anchor>] [before <text-filter-name-anchor>|after <text-filter-name-anchor>]

##Management
netq del notification channel <text-channel-name-anchor>
netq del notification filter <text-filter-name-anchor>
netq del notification rule <text-rule-name-anchor>
netq show notification [channel|filter|rule] [json]
```

The options are described in the following sections where they are used.

Configure a Proxy Server

To send notification messages through a proxy server instead of directly to a notification channel, you configure NetQ with the hostname and optionally a port of a proxy server. If no port is specified, NetQ defaults to port 80. Only one proxy server is currently supported. To simplify deployment, configure your proxy server before configuring channels, rules, or filters.To configure the proxy server:

```
cumulus@switch:~$ netq add notification proxy <text-proxy-hostname> [port <text-proxy-port]
cumulus@switch:~$ netq add notification proxy proxy4
Successfully configured notifier proxy proxy4:80
```

You can view the proxy server settings by running the `netq show notification proxy` command.

```
cumulus@switch:~$ netq show notification proxy
Matching config_notify records:
Proxy URL          Slack Enabled              PagerDuty Enabled
------------------ --------------------------
----------------------------------
proxy4:80          yes                        yes
```

You can remove the proxy server by running the `netq del notification proxy` command. This changes the NetQ behavior to send events directly to the notification channels.

```
cumulus@switch:~$ netq del notification proxy
Successfully overwrote notifier proxy to null
```

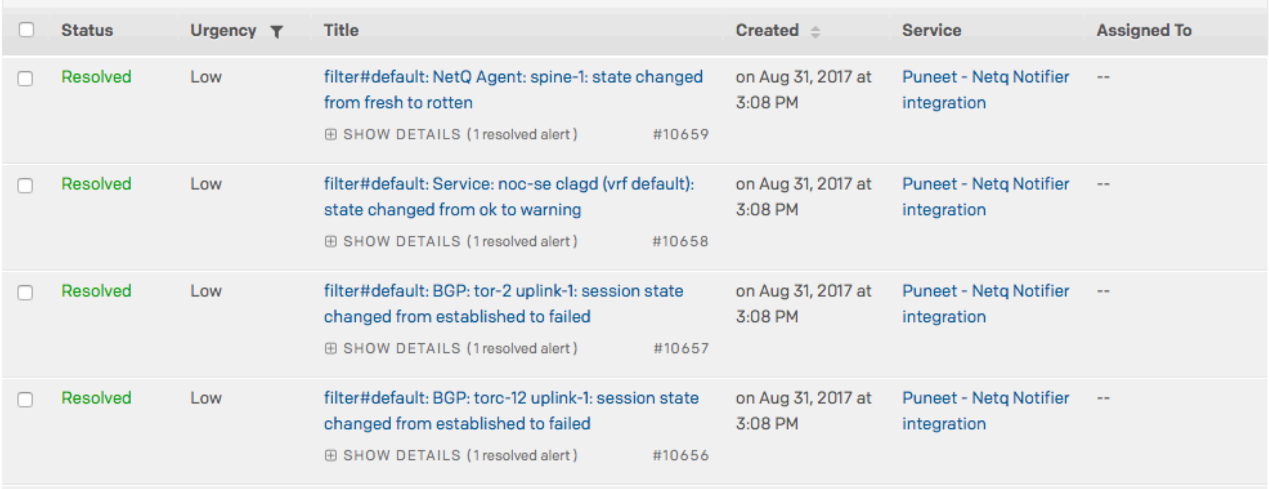
Create Channels

Create one or more PagerDuty and Slack channels to present the notifications.

Configure a PagerDuty Channel

NetQ sends notifications to PagerDuty as PagerDuty events.

For example:



☐	Status	Urgency	Title	Created	Service	Assigned To
☐	Resolved	Low	filter#default: NetQ Agent: spine-1: state changed from fresh to rotten ⊞ SHOW DETAILS (1 resolved alert) #10659	on Aug 31, 2017 at 3:08 PM	Puneet - Netq Notifier integration	--
☐	Resolved	Low	filter#default: Service: noc-se clagd (vrf default): state changed from ok to warning ⊞ SHOW DETAILS (1 resolved alert) #10658	on Aug 31, 2017 at 3:08 PM	Puneet - Netq Notifier integration	--
☐	Resolved	Low	filter#default: BGP: tor-2 uplink-1: session state changed from established to failed ⊞ SHOW DETAILS (1 resolved alert) #10657	on Aug 31, 2017 at 3:08 PM	Puneet - Netq Notifier integration	--
☐	Resolved	Low	filter#default: BGP: torc-12 uplink-1: session state changed from established to failed ⊞ SHOW DETAILS (1 resolved alert) #10656	on Aug 31, 2017 at 3:08 PM	Puneet - Netq Notifier integration	--

To configure the NetQ notifier to send notifications to PagerDuty:

1. Configure the following options using the `netq add notification channel` command:

Option	Description
CHANNEL_TYPE <text-channel-name>	The third-party notification channel and name; use *pagerduty* in this case.

Option	Description
integration-key <text-integration-key>	The integration key is also called the service_key or routing_key. The default is an empty string ("").
severity	(Optional) The log level to set, which can be one of *info*, *warning*, *error*, *critical* or *debug*. The severity defaults to *info*.

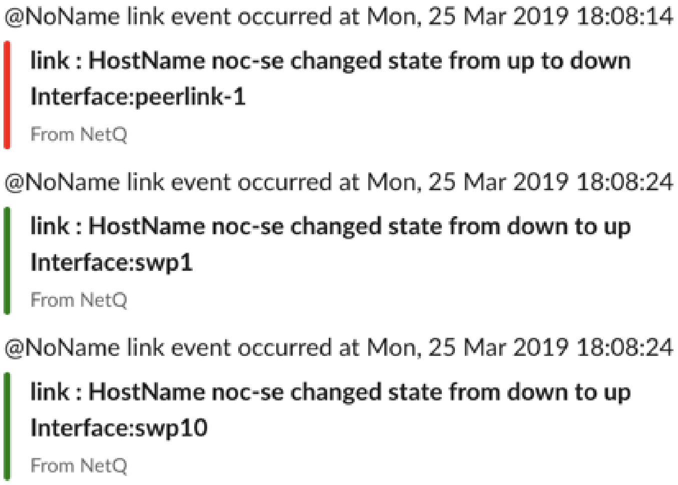
```
cumulus@switch:~$ netq add notification channel pagerduty pd-
netq-events integration-key c6d666e210a8425298ef7abde0d1998
Successfully added/updated channel pd-netq-events
```

2. Verify that the channel is configured properly.

```
cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name             Type             Severity         Channel Info
---------------- ---------------- ----------------
------------------------
pd-netq-events   pagerduty        info             integration-
key: c6d666e

210a8425298ef7abde0d1998
```

Configure a Slack Channel

NetQ Notifier sends notifications to Slack as incoming webhooks for a Slack channel you configure. For example:



@NoName link event occurred at Mon, 25 Mar 2019 18:08:14

link : HostName noc-se changed state from up to down
Interface:peerlink-1
From NetQ

@NoName link event occurred at Mon, 25 Mar 2019 18:08:24

link : HostName noc-se changed state from down to up
Interface:swp1
From NetQ

@NoName link event occurred at Mon, 25 Mar 2019 18:08:24

link : HostName noc-se changed state from down to up
Interface:swp10
From NetQ

To configure NetQ to send notifications to Slack:

1. If needed, create one or more Slack channels on which to receive the notifications.

a. Click **+** next to **Channels**.

b. Enter a name for the channel, and click **Create Channel**.

c. Navigate to the new channel.

d. Click **+ Add an app** link below the channel name to open the application directory.

e. In the search box, start typing *incoming* and select **Incoming WebHooks** when it appears.

f. Click **Add Configuration** and enter the name of the channel you created (where you want to post notifications).

g. Click **Add Incoming WebHooks integration**.

h. Save WebHook URL in a text file for use in next step.

2. Configure the following options in the `netq config add notification channel` command:

Option	Description
CHANNEL_TYPE <text-channel-name>	The third-party notification channel name; use *slack* in this case.
WEBHOOK	Copy the WebHook URL from the text file OR in the desired channel, locate the initial message indicating the addition of the webhook, click **incoming-webhook** link, click **Settings**. Example URL: `https://hooks.slack.com/services/text/moretext/evenmoretext`
severity	The log level to set, which can be one of *error, warning, info,* or *debug*. The severity defaults to *info*.
tag	Optional tag appended to the Slack notification to highlight particular channels or people. The tag value must be preceded by the @ sign. For example, *@netq-info*.

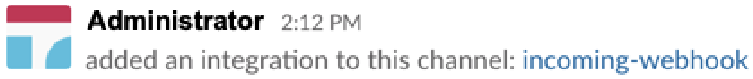
```
cumulus@switch:~$ netq add notification channel slack slk-netq-
events webhook https://hooks.slack.com/services/text/moretext
/evenmoretext
Successfully added/updated channel netq-events
```

3. Verify the channel is configured correctly.
From the CLI:

```
cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name            Type             Severity Channel Info
--------------- ---------------- -------- ----------------------
slk-netq-events slack            info     webhook:https://hooks.s
                                          lack.com/services/text/
```

```
                                           moretext
/evenmoretext
```

From the Slack Channel:



Administrator 2:12 PM
added an integration to this channel: incoming-webhook

Create Rules

Each rule is comprised of a single key-value pair. The key-value pair indicates what messages to include or drop from event information sent to a notification channel. You can create more than one rule for a single filter. Creating multiple rules for a given filter can provide a very defined filter. For example, you can specify rules around hostnames or interface names, enabling you to filter messages specific to those hosts or interfaces. You should have already defined the PagerDuty or Slack channels (as described earlier).

There is a fixed set of valid rule keys. Values are entered as regular expressions and *vary according to your deployment*.

Service	Rule Key	Description	Example Rule Values
BGP	message_type	Network protocol or service identifier	bgp
	hostname	User-defined, text-based name for a switch or host	server02, leaf11, exit01, spine-4
	peer	User-defined, text-based name for a peer switch or host	server4, leaf-3, exit02, spine06
	desc	Text description	
	vrf	Name of VRF interface	mgmt, default
	old_state	Previous state of the BGP service	Established, Failed
	new_state	Current state of the BGP service	Established, Failed
	old_last_reset_time	Previous time that BGP service was reset	Apr3, 2019, 4:17 pm
	new_last_reset_time	Most recent time that BGP service was reset	Apr8, 2019, 11:38 am
MLAG (CLAG)	message_type	Network protocol or service identifier	clag
	hostname		

Service	Rule Key	Description	Example Rule Values
		User-defined, text-based name for a switch or host	server02, leaf-9, exit01, spine04
	old_conflicted_bonds	Previous pair of interfaces in a conflicted bond	swp7 swp8, swp3 swp4
	new_conflicted_bonds	Current pair of interfaces in a conflicted bond	swp11 swp12, swp23 swp24
	old_state_protodownbond	Previous state of the bond	protodown, up
	new_state_protodownbond	Current state of the bond	protodown, up
ConfigDiff	message_type	Network protocol or service identifier	configdiff
	hostname	User-defined, text-based name for a switch or host	server02, leaf11, exit01, spine-4
	vni	Virtual Network Instance identifier	12, 23
	old_state	Previous state of the configuration file	created, modified
	new_state	Current state of the configuration file	created, modified
EVPN	message_type	Network protocol or service identifier	evpn
	hostname	User-defined, text-based name for a switch or host	server02, leaf-9, exit01, spine04
	vni	Virtual Network Instance identifier	12, 23
	old_in_kernel_state	Previous VNI state, in kernel or not	true, false
	new_in_kernel_state	Current VNI state, in kernel or not	true, false
	old_adv_all_vni_state	Previous VNI advertising state, advertising all or not	true, false
	new_adv_all_vni_state	Current VNI advertising state, advertising all or not	true, false

Service	Rule Key	Description	Example Rule Values
Link	message_type	Network protocol or service identifier	link
	hostname	User-defined, text-based name for a switch or host	server02, leaf-6, exit01, spine7
	ifname	Software interface name	eth0, swp53
LLDP	message_type	Network protocol or service identifier	lldp
	hostname	User-defined, text-based name for a switch or host	server02, leaf41, exit01, spine-5, tor-36
	ifname	Software interface name	eth1, swp12
	old_peer_ifname	Previous software interface name	eth1, swp12, swp27
	new_peer_ifname	Curent software interface name	eth1, swp12, swp27
	old_peer_hostname	Previous user-defined, text-based name for a peer switch or host	server02, leaf41, exit01, spine-5, tor-36
	new_peer_hostname	Current user-defined, text-based name for a peer switch or host	server02, leaf41, exit01, spine-5, tor-36
Node	message_type	Network protocol or service identifier	node
	hostname	User-defined, text-based name for a switch or host	server02, leaf41, exit01, spine-5, tor-36
	ntp_state	Current state of NTP service	in sync, not sync
	db_state	Current state of DB	Add, Update, Del, Dead
NTP	message_type	Network protocol or service identifier	ntp
	hostname	User-defined, text-based name for a switch or host	server02, leaf-9, exit01, spine04
	old_state	Previous state of service	in sync, not sync

Service	Rule Key	Description	Example Rule Values
	new_state	Current state of service	in sync, not sync
Port	message_type	Network protocol or service identifier	port
	hostname	User-defined, text-based name for a switch or host	server02, leaf13, exit01, spine-8, tor-36
	ifname	Interface name	eth0, swp14
	old_speed	Previous speed rating of port	10 G, 25 G, 40 G, unknown
	old_transreceiver	Previous transceiver	40G Base-CR4, 25G Base-CR
	old_vendor_name	Previous vendor name of installed port module	Amphenol, OEM, Mellanox, Fiberstore, Finisar
	old_serial_number	Previous serial number of installed port module	MT1507VS05177, AVE1823402U, PTN1VH2
	old_supported_fec	Previous forward error correction (FEC) support status	none, Base R, RS
	old_advertised_fec	Previous FEC advertising state	true, false, not reported
	old_fec	Previous FEC capability	none
	old_autoneg	Previous activation state of auto-negotiation	on, off
	new_speed	Current speed rating of port	10 G, 25 G, 40 G
	new_transreceiver	Current transceiver	40G Base-CR4, 25G Base-CR
	new_vendor_name	Current vendor name of installed port module	Amphenol, OEM, Mellanox, Fiberstore, Finisar
	new_part_number	Current part number of installed port module	SFP-H10GB-CU1M, MC3309130-001, 603020003

Service	Rule Key	Description	Example Rule Values
	new_serial_number	Current serial number of installed port module	MT1507VS05177, AVE1823402U, PTN1VH2
	new_supported_fec	Current FEC support status	none, Base R, RS
	new_advertised_fec	Current FEC advertising state	true, false
	new_fec	Current FEC capability	none
	new_autoneg	Current activation state of auto-negotiation	on, off
Sensors	sensor	Network protocol or service identifier	Fan: fan1, fan-2 Power Supply Unit: psu1, psu2 Temperature: psu1temp1, temp2
	hostname	User-defined, text-based name for a switch or host	server02, leaf-26, exit01, spine2-4
	old_state	Previous state of a fan, power supply unit, or thermal sensor	Fan: ok, absent, bad PSU: ok, absent, bad Temp: ok, busted, bad, critical
	new_state	Current state of a fan, power supply unit, or thermal sensor	Fan: ok, absent, bad PSU: ok, absent, bad Temp: ok, busted, bad, critical
	old_s_state	Previous state of a fan or power supply unit.	Fan: up, down PSU: up, down
	new_s_state	Current state of a fan or power supply unit.	Fan: up, down PSU: up, down
	new_s_max	Current maximum temperature threshold value	Temp: 110
	new_s_crit	Current critical high temperature threshold value	Temp: 85
	new_s_lcrit	Current critical low temperature threshold value	Temp: -25

Service	Rule Key	Description	Example Rule Values
	new_s_min	Current minimum temperature threshold value	Temp: -50
Services	message_type	Network protocol or service identifier	services
	hostname	User-defined, text-based name for a switch or host	server02, leaf03, exit01, spine-8
	name	Name of service	clagd, lldpd, ssh, ntp, netqd, net-agent
	old_pid	Previous process or service identifier	12323, 52941
	new_pid	Current process or service identifier	12323, 52941
	old_status	Previous status of service	up, down
	new_status	Current status of service	up, down

> Rule names are case sensitive, and no wildcards are permitted. Rule names may contain spaces, but must be enclosed with single quotes in commands. It is easier to use dashes in place of spaces or mixed case for better readability. For example, use bgpSessionChanges or BGP-session-changes or BGPsessions, instead of 'BGP Session Changes'.
>
> Use Tab completion to view the command options syntax.

Example Rules

Create a BGP Rule Based on Hostname:

```
cumulus@switch:~$ netq add notification rule bgpHostname key hostname
value spine-01
Successfully added/updated rule bgpHostname
```

Create a Rule Based on a Configuration File State Change:

```
cumulus@switch:~$ netq add notification rule sysconf key configdiff
value updated
Successfully added/updated rule sysconf
```

Create an EVPN Rule Based on a VNI:

```
cumulus@switch:~$ netq add notification rule evpnVni key vni value 42
Successfully added/updated rule evpnVni
```

Create an Interface Rule Based on FEC Support:

```
cumulus@switch:~$ netq add notification rule fecSupport key
new_supported_fec value supported
Successfully added/updated rule fecSupport
```

Create a Service Rule Based on a Status Change:

```
cumulus@switch:~$ netq add notification rule svcStatus key new_status
value down
Successfully added/updated rule svcStatus
```

Create a Sensor Rule Based on a Threshold:

```
cumulus@switch:~$ netq add notification rule overTemp key new_s_crit
value 24
Successfully added/updated rule overTemp
```

Create an Interface Rule Based on Port:

```
cumulus@switch:~$ netq add notification rule swp52 key port value
swp52
Successfully added/updated rule swp52
```

View the Rule Configurations

Use the `netq show notification` command to view the rules on your platform.

```
cumulus@switch:~$ netq show notification rule

Matching config_notify records:
Name             Rule Key         Rule Value
---------------- ---------------- --------------------
bgpHostname      hostname         spine-01
evpnVni          vni              42
fecSupport       new_supported_fe supported
                 c
overTemp         new_s_crit       24
```

```
svcStatus       new_status       down
swp52            port             swp52
sysconf         configdiff       updated
```

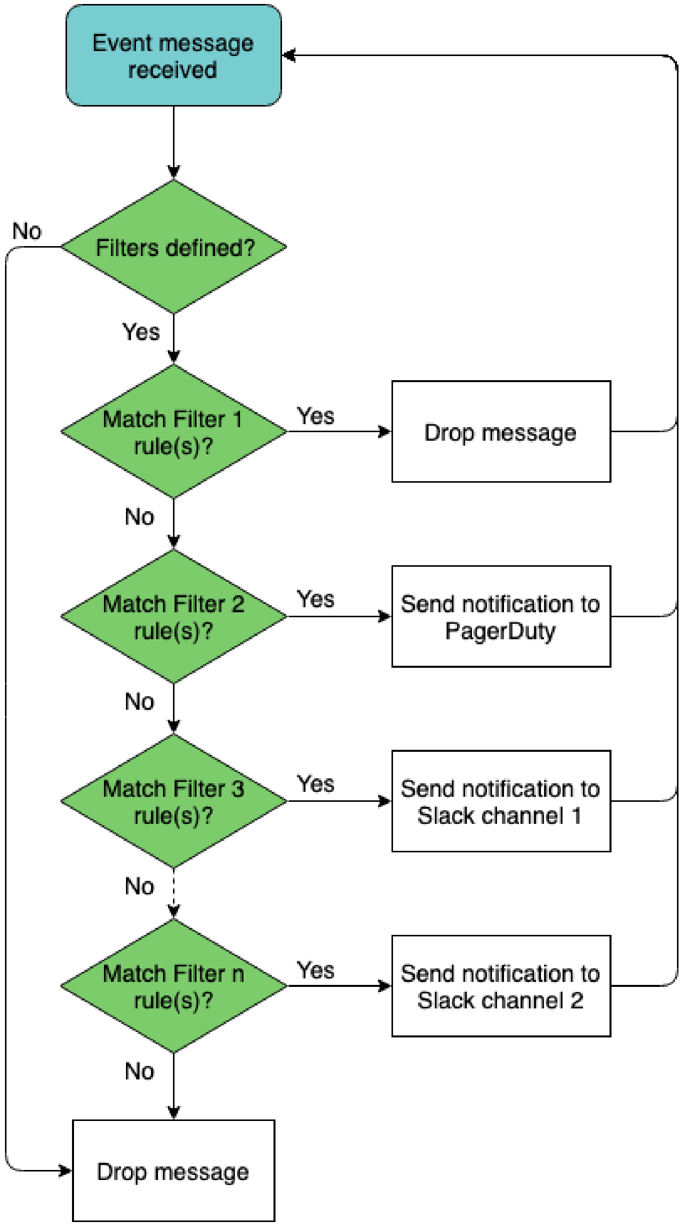
Create Filters

You can limit or direct event messages using filters. Filters are created based on rules you define; like those in the previous section. Each filter contains one or more rules. When a message matches the rule, it is sent to the indicated destination. Before you can create filters, you need to have already defined the rules and configured PagerDuty and/or Slack channels (as described earlier).

As filters are created, they are added to the bottom of a filter list. By default, filters are processed in the order they appear in this list (from top to bottom) until a match is found. This means that each event message is first evaluated by the first filter listed, and if it matches then it is processed, ignoring all other filters, and the system moves on to the next event message received. If the event does not match the first filter, it is tested against the second filter, and if it matches then it is processed and the system moves on to the next event received. And so forth. Events that do not match any filter are ignored.

You may need to change the order of filters in the list to ensure you capture the events you want and drop the events you do not want. This is possible using the *before* or *after* keywords to ensure one rule is processed before or after another.

This diagram shows an example with four defined filters with sample output results.



> ⓘ Filter names may contain spaces, but *must* be enclosed with single quotes in commands. It is easier to use dashes in place of spaces or mixed case for better readability. For example, use bgpSessionChanges or BGP-session-changes or BGPsessions, instead of 'BGP Session Changes'. Filter names are also case sensitive.

Example Filters

Create a filter for BGP Events on a Particular Device:

```
cumulus@switch:~$ netq add notification filter bgpSpine rule
bgpHostname channel pd-netq-events
Successfully added/updated filter bgpSpine
```

Create a Filter for a Given VNI in Your EVPN Overlay:

```
cumulus@switch:~$ netq add notification filter vni42 severity warning
rule evpnVni channel pd-netq-events
Successfully added/updated filter vni42
```

Create a Filter for when a Configuration File has been Updated:

```
cumulus@switch:~$ netq add notification filter configChange severity
info rule sysconf channel slk-netq-events
Successfully added/updated filter configChange
```

Create a Filter to Monitor Ports with FEC Support:

```
cumulus@switch:~$ netq add notification filter newFEC rule fecSupport
channel slk-netq-events
Successfully added/updated filter newFEC
```

Create a Filter to Monitor for Services that Change to a Down State:

```
cumulus@switch:~$ netq add notification filter svcDown severity error
rule svcStatus channel slk-netq-events
Successfully added/updated filter svcDown
```

Create a Filter to Monitor Overheating Platforms:

```
cumulus@switch:~$ netq add notification filter critTemp severity
error rule overTemp channel pd-netq-events
Successfully added/updated filter critTemp
```

Create a Filter to Drop Messages from a Given Interface, and match against this filter before any other filters. To create a drop style filter, do not specify a channel. To put the filter first, use the *before* option.

```
cumulus@switch:~$ netq add notification filter swp52Drop severity
error rule swp52 before bgpSpine
Successfully added/updated filter swp52Drop
```

View the Filter Configurations

Use the `netq show notification` command to view the filters on your platform.

```
cumulus@switch:~$ netq show notification filter
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
swp52Drop        1           error            NetqDefaultChann swp52
                                            el
bgpSpine        2           info             pd-netq-events
bgpHostnam
                                                             e
vni42              3           warning          pd-netq-events
evpnVni
configChange    4           info             slk-netq-events  sysconf
newFEC          5           info             slk-netq-events
fecSupport
svcDown         6           critical         slk-netq-events
svcStatus
critTemp        7           critical         pd-netq-events   overTemp
```

Reorder Filters

When you look at the results of the `netq show notification filter` command above, you might notice that although you have the drop-based filter first (no point in looking at something you are going to drop anyway, so that is good), but the critical severity events are processed last, per the current definitions. If you wanted to process those before lesser severity events, you can reorder the list using the *before* and *after* options.

For example, to put the two critical severity event filters just below the drop filter:

```
cumulus@switch:~$ netq add notification filter critTemp after
swp52Drop
Successfully added/updated filter critTemp
cumulus@switch:~$ netq add notification filter svcDown before bgpSpine
Successfully added/updated filter svcDown
```

✓ You do not need to reenter all the severity, channel, and rule information for existing rules if you only want to change their processing order.

Run the `netq show notification` command again to verify the changes:

```
cumulus@switch:~$ netq show notification filter
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
swp52Drop        1           error            NetqDefaultChann swp52
                                            el
```

```
critTemp        2           critical         pd-netq-events   overTemp
svcDown         3           critical         slk-netq-events
svcStatus
bgpSpine        4           info             pd-netq-events
bgpHostnam
                                                             e
vni42              5           warning          pd-netq-events
evpnVni
configChange    6           info             slk-netq-events  sysconf
newFEC          7           info             slk-netq-events
fecSupport
```

Example Notification Configurations

Putting all of these channel, rule, and filter definitions together you create a complete notification configuration. The following are example notification configurations are created using the three-step process outlined above. Refer to Integrate NetQ with an Event Notification Application (see page 54) for details and instructions for creating channels, rules, and filters.

Create a Notification for BGP Events from a Selected Switch

In this example, we created a notification integration with a PagerDuty channel called *pd-netq-events*. We then created a rule *bgpHostname* and a filter called *4bgpSpine* for any notifications from *spine-01*. The result is that any info severity event messages from Spine-01 are filtered to the *pd-netq-events* channel.

```
cumulus@switch:~$ netq add notification channel pagerduty pd-netq-
events integration-key 1234567890
Successfully added/updated channel pd-netq-events
cumulus@switch:~$ netq add notification rule bgpHostname key node
value spine-01
Successfully added/updated rule bgpHostname

cumulus@switch:~$ netq add notification filter bgpSpine rule
bgpHostname channel pd-netq-events
Successfully added/updated filter bgpSpine
cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name            Type             Severity         Channel Info
--------------- ---------------- ----------------
------------------------
pd-netq-events  pagerduty        info             integration-key:
1234567

                                                  890

cumulus@switch:~$ netq show notification rule
Matching config_notify records:
Name            Rule Key         Rule Value
--------------- ---------------- --------------------
bgpHostname     hostname         spine-01
```

```
cumulus@switch:~$ netq show notification filter
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
bgpSpine        1           info             pd-netq-events
bgpHostnam
                                                               e
```

Create a Notification for Warnings on a Given EVPN VNI

In this example, we created a notification integration with a PagerDuty channel called *pd-netq-events*. We then created a rule *evpnVni* and a filter called *3vni42* for any warnings messages from VNI 42 on the EVPN overlay network. The result is that any warning severity event messages from VNI 42 are filtered to the *pd-netq-events* channel.

```
cumulus@switch:~$ netq add notification channel pagerduty pd-netq-
events integration-key 1234567890
Successfully added/updated channel pd-netq-events

cumulus@switch:~$ netq add notification rule evpnVni key vni value 42
Successfully added/updated rule evpnVni

cumulus@switch:~$ netq add notification filter vni42 rule evpnVni
channel pd-netq-events
Successfully added/updated filter vni42

cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name            Type             Severity         Channel Info
--------------- ---------------- ----------------
------------------------
pd-netq-events  pagerduty        info             integration-key:
1234567
                                                  890

cumulus@switch:~$ netq show notification rule
Matching config_notify records:
Name            Rule Key         Rule Value
--------------- ---------------- --------------------
bgpHostname     hostname         spine-01
evpnVni         vni              42

cumulus@switch:~$ netq show notification filter
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
```

```
bgpSpine        1           info             pd-netq-events
bgpHostnam
                                                               e
vni42           2           warning          pd-netq-events   evpnVni
```

Create a Notification for Configuration File Changes

In this example, we created a notification integration with a Slack channel called *slk-netq-events*. We then created a rule *sysconf* and a filter called *configChange* for any configuration file update messages. The result is that any configuration update messages are filtered to the *slk-netq-events* channel.

```
cumulus@switch:~$ netq add notification channel slack slk-netq-events
webhook https://hooks.slack.com/services/text/moretext/evenmoretext
Successfully added/updated channel slk-netq-events

cumulus@switch:~$ netq add notification rule sysconf key configdiff
value updated
Successfully added/updated rule sysconf

cumulus@switch:~$ netq add notification filter configChange severity
info rule sysconf channel slk-netq-events
Successfully added/updated filter configChange

cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name            Type             Severity Channel Info
--------------- ---------------- -------- ----------------------
slk-netq-events slack            info     webhook:https://hooks.s
                                          lack.com/services/text/
                                          moretext
/evenmoretext

cumulus@switch:~$ netq show notification rule
Matching config_notify records:
Name            Rule Key         Rule Value
--------------- ---------------- --------------------
bgpHostname     hostname         spine-01
evpnVni         vni              42
sysconf         configdiff       updated

cumulus@switch:~$ netq show notification filter
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
bgpSpine        1           info             pd-netq-events
bgpHostnam
                                                               e
vni42           2           warning          pd-netq-events   evpnVni
configChange    3           info             slk-netq-events  sysconf
```

Create a Notification for When a Service Goes Down

In this example, we created a notification integration with a Slack channel called *slk-netq-events*. We then created a rule *svcStatus* and a filter called *svcDown* for any services state messages indicating a service is no longer operational. The result is that any service down messages are filtered to the *slk-netq-events* channel.

```
cumulus@switch:~$ netq add notification channel slack slk-netq-events
webhook https://hooks.slack.com/services/text/moretext/evenmoretext
Successfully added/updated channel slk-netq-events

cumulus@switch:~$ netq add notification rule svcStatus key new_status
value down
Successfully added/updated rule svcStatus

cumulus@switch:~$ netq add notification filter svcDown severity error
rule svcStatus channel slk-netq-events
Successfully added/updated filter svcDown

cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name            Type             Severity Channel Info
--------------- ---------------- -------- ----------------------
slk-netq-events slack            info     webhook:https://hooks.s
                                          lack.com/services/text/
                                          moretext
/evenmoretext

cumulus@switch:~$ netq show notification rule
Matching config_notify records:
Name            Rule Key         Rule Value
--------------- ---------------- --------------------
bgpHostname     hostname         spine-01
evpnVni         vni              42
svcStatus       new_status       down
sysconf         configdiff       updated

cumulus@switch:~$ netq show notification filter
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
bgpSpine        1           info             pd-netq-events
bgpHostnam

                                                               e
vni42           2           warning          pd-netq-events   evpnVni
configChange    3           info             slk-netq-events  sysconf
svcDown         4           critical         slk-netq-events
svcStatus
```

Create a Filter to Drop Notifications from a Given Interface

In this example, we created a notification integration with a Slack channel called *slk-netq-events*. We then created a rule *swp52* and a filter called *swp52Drop* that drops all notifications for events from interface *swp52*.

```
cumulus@switch:~$ netq add notification channel slack slk-netq-events
webhook https://hooks.slack.com/services/text/moretext/evenmoretext
Successfully added/updated channel slk-netq-events

cumulus@switch:~$ netq add notification rule swp52 key port value
swp52
Successfully added/updated rule swp52

cumulus@switch:~$ netq add notification filter swp52Drop severity
error rule swp52 before bgpSpine
Successfully added/updated filter swp52Drop

cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name            Type             Severity Channel Info
--------------- ---------------- -------- ----------------------
slk-netq-events slack            info     webhook:https://hooks.s
                                          lack.com/services/text/
                                          moretext
/evenmoretext

cumulus@switch:~$ netq show notification rule
Matching config_notify records:
Name            Rule Key         Rule Value
--------------- ---------------- --------------------
bgpHostname     hostname         spine-01
evpnVni         vni              42
svcStatus       new_status       down
swp52            port             swp52
sysconf         configdiff       updated

cumulus@switch:~$ netq show notification filter
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
swp52Drop        1           error            NetqDefaultChann swp52
                                            el
bgpSpine        2           info             pd-netq-events
bgpHostnam
                                                               e
vni42           3           warning          pd-netq-events   evpnVni
configChange    4           info             slk-netq-events  sysconf
```

```
svcDown         5           critical         slk-netq-events
svcStatus
```

Create a Notification for a Given Device that has a Tendency to Overheat (using multiple rules)

In this example, we created a notification when switch *leaf04* has passed over the high temperature threshold. Two rules were needed to create this notification, one to identify the specific device and one to identify the temperature trigger. We sent the message to the *pd-netq-events* channel.

```
cumulus@switch:~$ netq add notification channel pagerduty pd-netq-
events integration-key 1234567890
Successfully added/updated channel pd-netq-events

cumulus@switch:~$ netq add notification rule switchLeaf04 key
hostname value leaf04
Successfully added/updated rule switchLeaf04
cumulus@switch:~$ netq add notification rule overTemp key new_s_crit
value 24
Successfully added/updated rule overTemp

cumulus@switch:~$ netq add notification filter critTemp rule
switchLeaf04 channel pd-netq-events
Successfully added/updated filter critTemp
cumulus@switch:~$ netq add notification filter critTemp severity
critical rule overTemp channel pd-netq-events
Successfully added/updated filter critTemp

cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name            Type             Severity         Channel Info
--------------- ---------------- ----------------
------------------------
pd-netq-events  pagerduty        info             integration-key:
1234567
                                                  890

cumulus@switch:~$ netq show notification rule
Matching config_notify records:
Name            Rule Key         Rule Value
--------------- ---------------- --------------------
bgpHostname     hostname         spine-01
evpnVni         vni              42
overTemp        new_s_crit       24
svcStatus       new_status       down
switchLeaf04    hostname         leaf04
swp52            port             swp52
sysconf         configdiff       updated
cumulus@switch:~$ netq show notification filter
```

```
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
swp52Drop        1           error            NetqDefaultChann swp52
                                            el
bgpSpine        2           info             pd-netq-events
bgpHostnam
                                                               e
vni42           3           warning          pd-netq-events   evpnVni
configChange    4           info             slk-netq-events  sysconf
svcDown         5           critical         slk-netq-events
svcStatus
critTemp        6           critical         pd-netq-events
switchLeaf
                                                               04

overTemp
```

View Notification Configurations in JSON Format

You can view configured integrations using the `netq show notification` commands. To view the channels, filters, and rules, run the three flavors of the command. Include the `json` option to display JSON-formatted output.

For example:

```
cumulus@switch:~$ netq show notification channel json
{
    "config_notify":[
        {
            "type":"slack",
            "name":"slk-netq-events",
            "channelInfo":"webhook:https://hooks.slack.com/services
/text/moretext/evenmoretext",
            "severity":"info"
        },
        {
            "type":"pagerduty",
            "name":"pd-netq-events",
            "channelInfo":"integration-key: 1234567890",
            "severity":"info"
    }
    ],
    "truncatedResult":false
}

cumulus@switch:~$ netq show notification rule json
{
    "config_notify":[
        {
            "ruleKey":"hostname",
            "ruleValue":"spine-01",
            "name":"bgpHostname"
        },
        {
            "ruleKey":"vni",
            "ruleValue":42,
            "name":"evpnVni"
        },
        {
            "ruleKey":"new_supported_fec",
            "ruleValue":"supported",
            "name":"fecSupport"
        },
        {
            "ruleKey":"new_s_crit",
            "ruleValue":24,
            "name":"overTemp"
        },
        {
            "ruleKey":"new_status",
            "ruleValue":"down",
            "name":"svcStatus"
        },
        {
            "ruleKey":"configdiff",
            "ruleValue":"updated",
            "name":"sysconf"
    }
    ],
    "truncatedResult":false
}

cumulus@switch:~$ netq show notification filter json
{
    "config_notify":[
        {
            "channels":"pd-netq-events",
            "rules":"overTemp",
            "name":"1critTemp",
            "severity":"critical"
        },
        {
            "channels":"pd-netq-events",
            "rules":"evpnVni",
            "name":"3vni42",
            "severity":"warning"
        },
        {
            "channels":"pd-netq-events",
            "rules":"bgpHostname",
            "name":"4bgpSpine",
            "severity":"info"
        },
        {
            "channels":"slk-netq-events",
            "rules":"sysconf",
            "name":"configChange",
            "severity":"info"
        },
        {
            "channels":"slk-netq-events",
            "rules":"fecSupport",
            "name":"newFEC",
            "severity":"info"
        },
        {
            "channels":"slk-netq-events",
            "rules":"svcStatus",
            "name":"svcDown",
            "severity":"critical"
    }
    ],
    "truncatedResult":false
}
```

Manage Event Notification Integrations

You might need to modify event notification configurations at some point in the lifecycle of your deployment. Optionally, you might want to configure a proxy.

Remove an Event Notification Channel

You can delete an event notification integration using the `netq config del notification` command. You can verify it has been removed using the related `show` command.

For example, to remove a Slack integration and verify it is no longer in the configuration:

```
cumulus@switch:~$ netq del notification channel slk-netq-events
cumulus@switch:~$ netq show notification channel
Matching config_notify records:
Name            Type             Severity         Channel Info
--------------- ---------------- ----------------
------------------------
pd-netq-events  pagerduty        info             integration-key:
1234567
                                                  890
```

Delete an Event Notification Rule

To delete a rule, use the following command, then verify it has been removed:

```
cumulus@switch:~$ netq del notification rule swp52
cumulus@switch:~$ netq show notification rule
Matching config_notify records:
Name            Rule Key         Rule Value
--------------- ---------------- --------------------
bgpHostname     hostname         spine-01
evpnVni         vni              42
overTemp        new_s_crit       24
svcStatus       new_status       down
switchLeaf04    hostname         leaf04
sysconf         configdiff       updated
```

Delete an Event Notification Filter

To delete a filter, use the following command, then verify it has been removed:

```
cumulus@switch:~$ netq del notification filter bgpSpine
cumulus@switch:~$ netq show notification filter
Matching config_notify records:
Name            Order      Severity         Channels         Rules
--------------- ---------- ---------------- ----------------
----------
swp52Drop        1           error            NetqDefaultChann swp52
                                            el
vni42           2           warning          pd-netq-events   evpnVni
configChange    3           info             slk-netq-events  sysconf
svcDown         4           critical         slk-netq-events
svcStatus
critTemp        5           critical         pd-netq-events
switchLeaf
                                                               04

overTemp
```

Integrate with a Hardware Chassis

NetQ can run within a Facebook Backpack chassis, Cumulus Express CX-10256-S chassis or Edgecore OMP-800 chassis.

Keep the following issues in mind if you intend to use NetQ with a chassis:

- You must assign a unique hostname to every node that runs the NetQ Agent. By default, all the fabric cards in the chassis have the same hostname.
- The NetQ Agent must be installed on every line card.

- No information is returned about the ASIC when you run `netq show inventory asic`. This is a known issue.
- Since the chassis sensor information is shared, every line card and fabric card can report the same sensor data. By default, sensor data is disabled on a chassis to avoid this duplication . To enable sensor data on a line card, edit `/etc/netq/netq.yml` or `/etc/netq/config.d/user.yml` and set the `send_chassis_sensor_data` keyword to *true*, then restart the NetQ Agent with `netq config agent restart`. Configuring NetQ in this way prevents any duplication of data in the NetQ database.

```
cumulus@chassis:~$ sudo nano /etc/netq/netq.yml

...
netq-agent:
  send_chassis_sensor_data: true
...
```

Upgrade from NetQ 1.x to NetQ 2.2.x

This document describes the steps required to upgrade from NetQ 1.x to NetQ 2.2.x on your hardware.

If you are switching to one of the NetQ appliances, refer to Getting started with the Cumulus NetQ Appliance or Getting started with the Cumulus NetQ Cloud Appliance for instructions on installing and configuring the appliance.

> ⓘ Data collected in the NetQ 1.x environment cannot be migrated to the NetQ 2.2 environment. Event notification configurations must also be reconfigured as the CLI commands have changed. Upgrading from NetQ 1.x version requires a fresh install as described here.

Contents

This topic describes how to...

Prerequisites

Hardware Requirements

NetQ is supported a variety of hardware.

⚠ **IMPORTANT**

Before upgrading, verify that your server meets these hardware requirements to ensure the VM will run properly.

The NetQ software requires a server with the following:

Requirement	Minimum On-site Requirement	Minimum Cloud Requirement
Processor	Eight (8) virtual CPUs	Four (4) virtual CPUs
Memory	64 GB RAM minimum	8 GB RAM
Local disk storage	256 GB SSD (**Note**: This must be an SSD; use of other storage options can lead to system instability and are not supported.)	32 GB (SSD not required)
Network interface speed	1 Gb NIC or higher	1 Gb NIC

You must also open the following ports on on your hardware to use the NetQ software:

Port	Deployment Type	Software Component Access
31980	On-site and cloud	NetQ Platform
32708	On-site	API Gateway
32666	On-site	Web-based User Interface

ⓘ These ports have changed from NetQ 1.4 and earlier.

NetQ Platform HyperVisor Requirements

The NetQ Platform can be installed as a Virtual Machine (VM) using one of the following hypervisors:

- VMware ESXi™ 6.5 for servers running Cumulus Linux, CentOS, Ubuntu and RedHat operating systems.
- KVM/QCOW (QEMU Copy on Write) image for servers running CentOS, Ubuntu and RedHat operating systems.

NetQ Agent Operating System Requirements

NetQ 2.2 Agents are supported on the following switch and host operating systems:

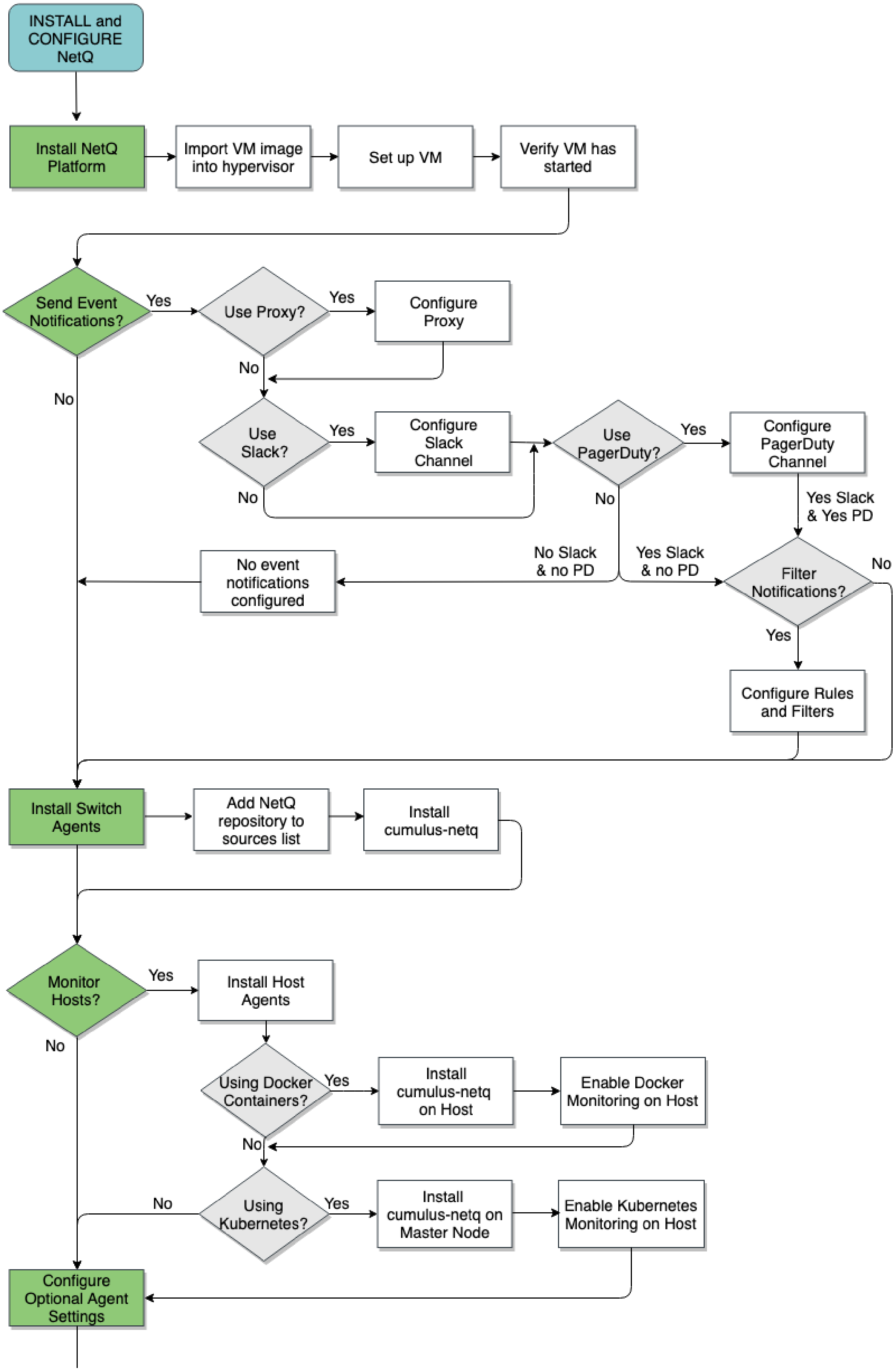
- Cumulus Linux 3.3.0 and later
- Ubuntu 16.04
- Red Hat® Enterprise Linux (RHEL) 7.1
- CentOS 7

NetQ Application Support

The NetQ CLI, UI, and RESTful API are supported on NetQ 2.1.0 and later. NetQ 1.4, and earlier, applications are not supported in NetQ 2.x.

Upgrade Workflow

The upgrade from NetQ 1.x involves installing the NetQ Platform, and installing and configuring the NetQ Agents. Additional steps are needed to Integrate NetQ with Event Notification Applications (see page 52) . This flow chart shows the required steps to install and setup NetQ to start validating your network and the optional steps of integrating with event notification applications and monitoring hosts.


INSTALL and CONFIGURE NetQ
Install NetQ Platform
Import VM image into hypervisor
Set up VM
Verify VM has started
Send Event Notifications?
Yes
No
Use Proxy?
Yes
No
Configure Proxy
Use Slack?
Yes
No
Configure Slack Channel
Use PagerDuty?
Yes
No
Configure PagerDuty Channel
Yes Slack & Yes PD
No Slack & no PD
Yes Slack & no PD
No event notifications configured
Filter Notifications?
No
Yes
Configure Rules and Filters
Install Switch Agents
Add NetQ repository to sources list
Install cumulus-netq
Monitor Hosts?
Yes
No
Install Host Agents
Using Docker Containers?
Yes
No
Install cumulus-netq on Host
Enable Docker Monitoring on Host
Using Kubernetes?
Yes
No
Install cumulus-netq on Master Node
Enable Kubernetes Monitoring on Host
Configure Optional Agent Settings

Upgrade the NetQ Platform

The first step of the upgrade is to install the NetQ software onto your hardware (NetQ Platform).

The NetQ software is comprised of the following components:

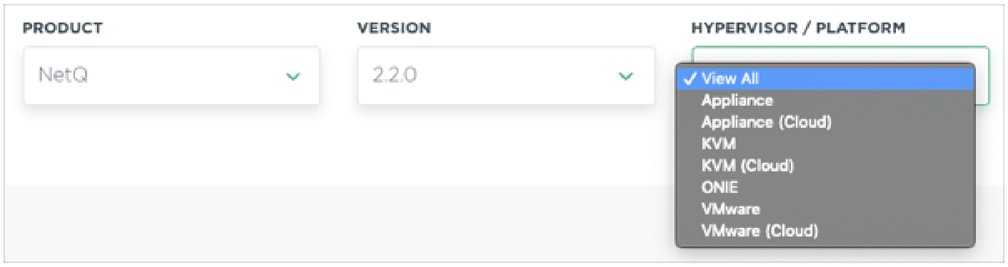
- **NetQ applications**: network monitoring and analytics functionality
- **NetQ CLI**: command line user interface for monitoring network and administering NetQ through a terminal session
- **NetQ UI**: graphical interface for monitoring network and administering NetQ
- **NetQ API**: Restful application programming interface for accessing NetQ data and integrating with third-party tools
- **NetQ notifier**: application used to send event notifications to third-party notification tools

> ### Best Practice
>
> Cumulus Networks recommends you install the NetQ software on a server that is part of an out-of-band management network to ensure it can monitor in-band network issues without being affected itself. You should run the software on a separate, powerful server to ensure proper operation and for maximum usability and performance. Refer to Hardware Requirements (see page 82) for specifics.

Install NetQ VM Image

To install the NetQ software onto your own hardware:

1. **IMPORTANT**: Confirm that your server hardware meets the requirements set out here (see page 82).
2. Download the NetQ Platform image.
   a. On the Cumulus Downloads page, select *NetQ* from the **Product** list box.
   b. Click *2.2* from the **Version** list box, and then select *2.2.x* from the submenu.
   c. Optionally, select the hypervisor you wish to use (*VMware, VMware (cloud), KVM,* or *KVM (cloud)*) from the **Hypervisor/Platform** list box.
   Note: You can ignore the ONIE and Appliance options, as they are for the NetQ appliances.

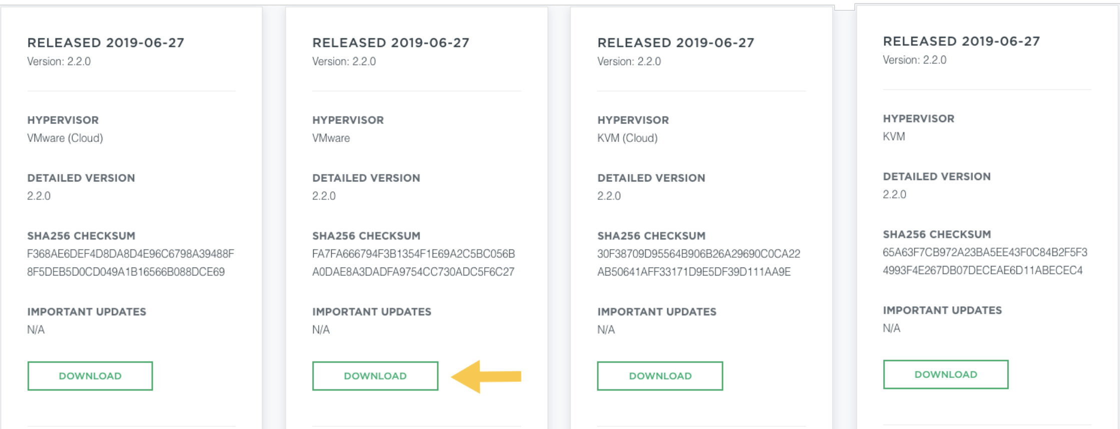


PRODUCT: NetQ

VERSION: 2.2.0

HYPERVISOR / PLATFORM: ✓ View All

d. Scroll down to review the images that match your selection criteria, and click **Download** for the image you want.



RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
VMware (Cloud)

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
F368AE6DEF4D8DA8D4E96C6798A39488F8F5DEB5D0CD049A1B16566B088DCE69

IMPORTANT UPDATES
N/A

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
VMware

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
FA7FA666794F3B1354F1E69A2C5BC056BA0DAE8A3DADFA9754CC730ADC5F6C27

IMPORTANT UPDATES
N/A

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
KVM (Cloud)

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
30F38709D95564B906B26A29690C0CA22AB50641AFF33171D9E5DF39D111AA9E

IMPORTANT UPDATES
N/A

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
KVM

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
65A63F7CB972A23BA5EE43F0C84B2F5F34993F4E267DB07DECEAE6D11ABECEC4

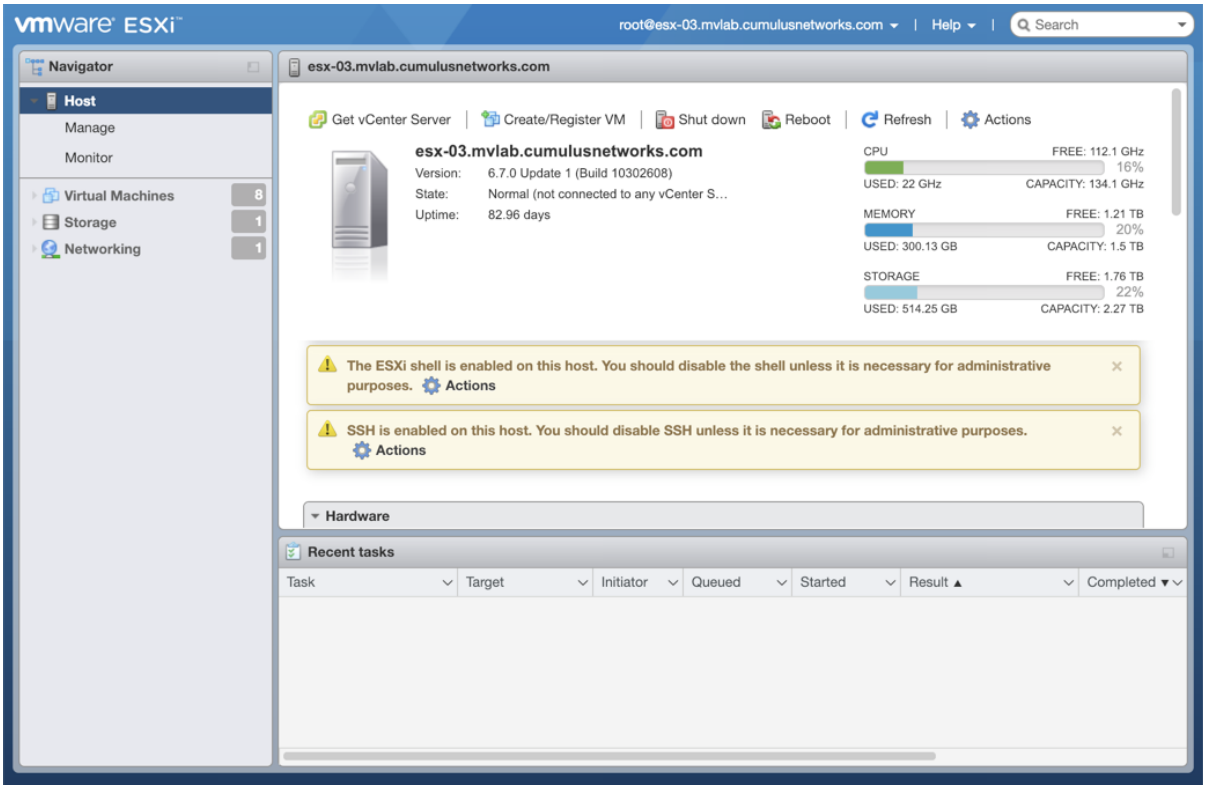
IMPORTANT UPDATES
N/A

3. Open your hypervisor and set up your VM.
   You can use these examples for reference or use your own hypervisor instructions.

VMware example

This example shows the VM setup process using an OVA file with VMware ESXi.

1. Enter the address of the hardware in your browser.
2. Log in to VMware using credentials with root access.



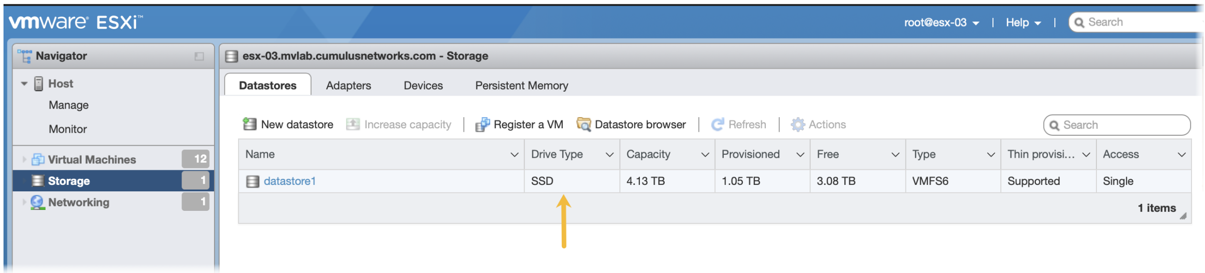
esx-03.mvlab.cumulusnetworks.com
Version: 6.7.0 Update 1 (Build 10302608)
State: Normal (not connected to any vCenter S…
Uptime: 82.96 days

CPU FREE: 112.1 GHz 16% USED: 22 GHz CAPACITY: 134.1 GHz
MEMORY FREE: 1.21 TB 20% USED: 300.13 GB CAPACITY: 1.5 TB
STORAGE FREE: 1.76 TB 22% USED: 514.25 GB CAPACITY: 2.27 TB

The ESXi shell is enabled on this host. You should disable the shell unless it is necessary for administrative purposes. Actions

SSH is enabled on this host. You should disable SSH unless it is necessary for administrative purposes. Actions

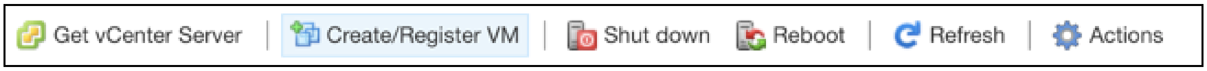
3. Click **Storage** in the Navigator to verify you have an SSD installed.



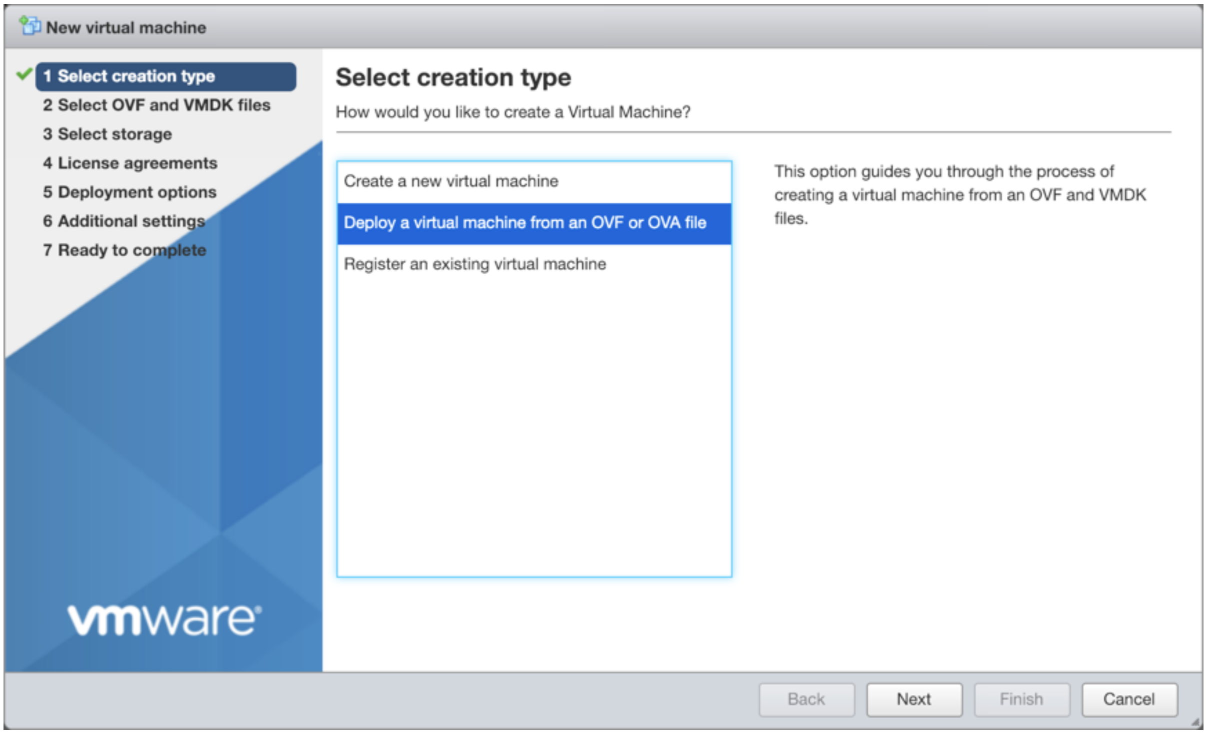
Name	Drive Type	Capacity	Provisioned	Free	Type	Thin provisi...	Access
datastore1	SSD	4.13 TB	1.05 TB	3.08 TB	VMFS6	Supported	Single

1 items

4. Click **Create/Register VM** at the top of the right pane.



5. Select **Deploy a virtual machine from and OVF or OVA file**, and click **Next**.



Select creation type

How would you like to create a Virtual Machine?

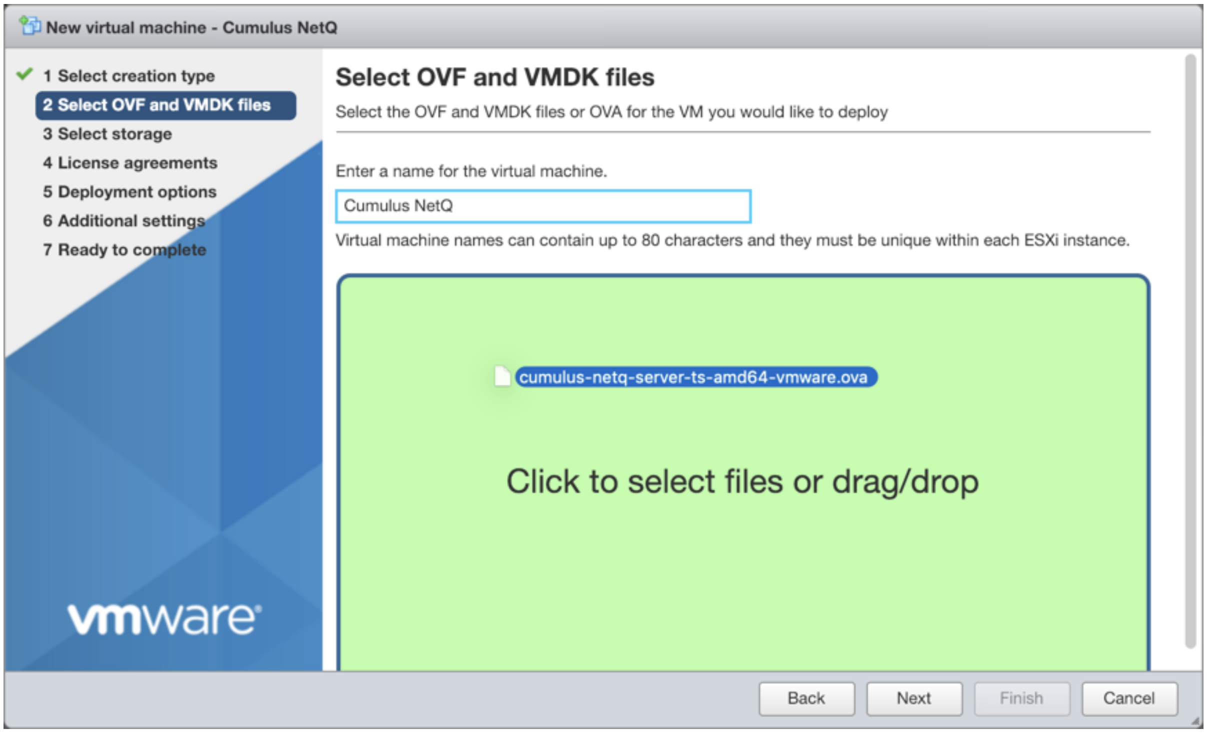
Create a new virtual machine

Deploy a virtual machine from an OVF or OVA file

Register an existing virtual machine

This option guides you through the process of creating a virtual machine from an OVF and VMDK files.

6. Provide a name for the VM, for example *Cumulus NetQ*.
7. Drag and drop the NetQ Platform image file you downloaded in Step 1 above.
8. Click **Next**.



Select OVF and VMDK files

Select the OVF and VMDK files or OVA for the VM you would like to deploy

Enter a name for the virtual machine.

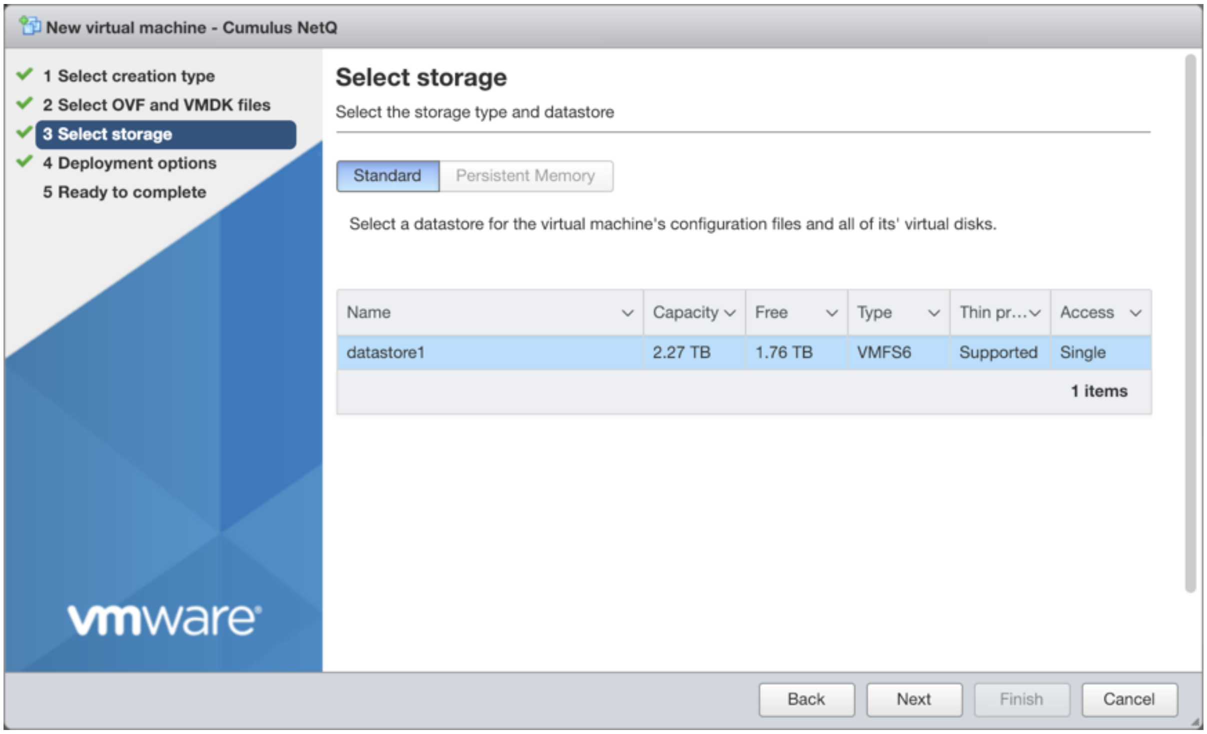
Cumulus NetQ

Virtual machine names can contain up to 80 characters and they must be unique within each ESXi instance.

cumulus-netq-server-ts-amd64-vmware.ova

Click to select files or drag/drop

9. Select the storage type and data store for the image to use, then click **Next**. In this example, only one is available.



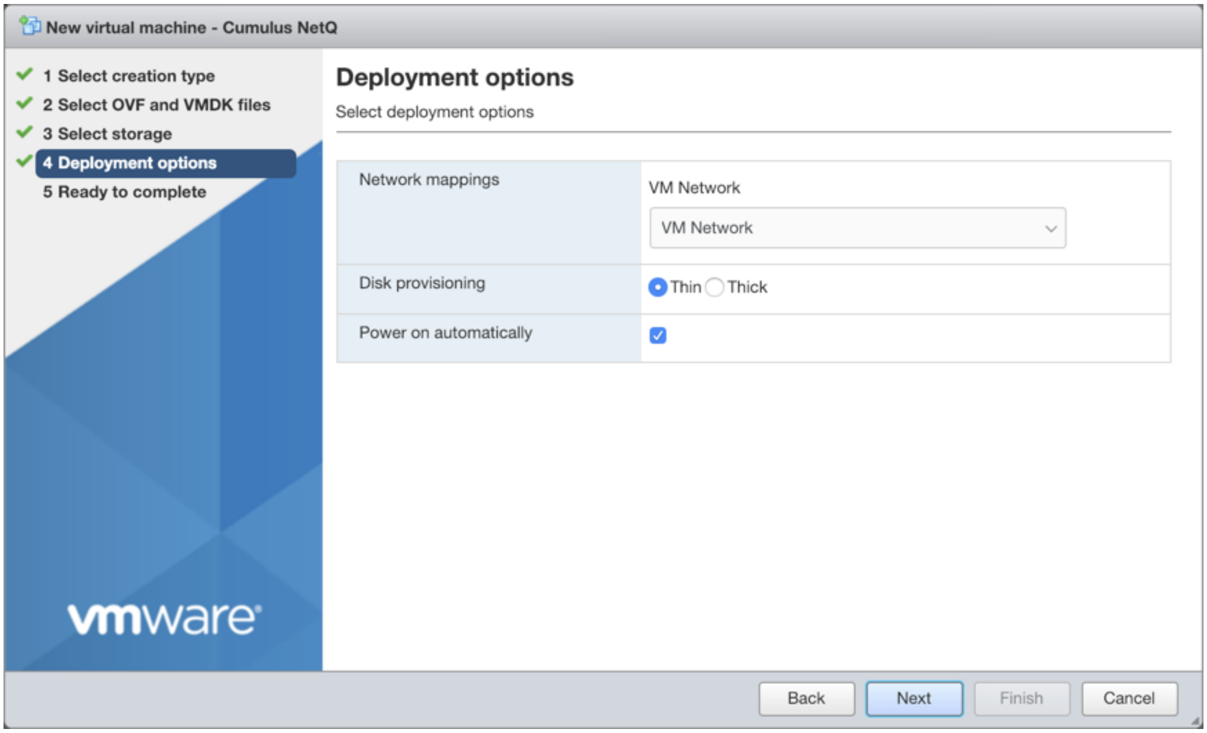
Select storage

Select the storage type and datastore

Select a datastore for the virtual machine's configuration files and all of its' virtual disks.

Name	Capacity	Free	Type	Thin pr...	Access
datastore1	2.27 TB	1.76 TB	VMFS6	Supported	Single
					1 items

10. Accept the default deployment options or modify them according to your network needs. Click **Next** when you are finished.



New virtual machine - Cumulus NetQ

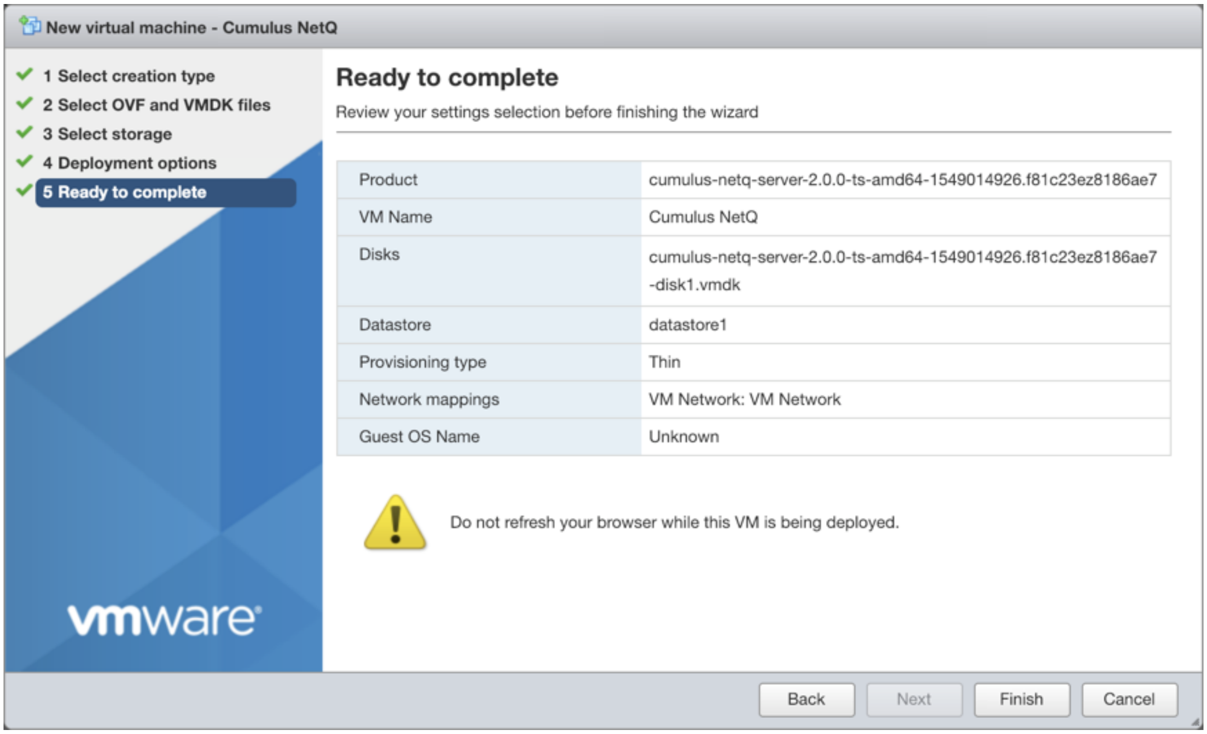
- ✓ 1 Select creation type
- ✓ 2 Select OVF and VMDK files
- ✓ 3 Select storage
- ✓ 4 Deployment options
- 5 Ready to complete

Deployment options

Select deployment options

Network mappings	VM Network VM Network
Disk provisioning	● Thin ○ Thick
Power on automatically	☑

11. Review the configuration summary. Click **Back** to change any of the settings, or click **Finish** to continue with the creation of the VM.



New virtual machine - Cumulus NetQ

- ✓ 1 Select creation type
- ✓ 2 Select OVF and VMDK files
- ✓ 3 Select storage
- ✓ 4 Deployment options
- ✓ 5 Ready to complete

Ready to complete

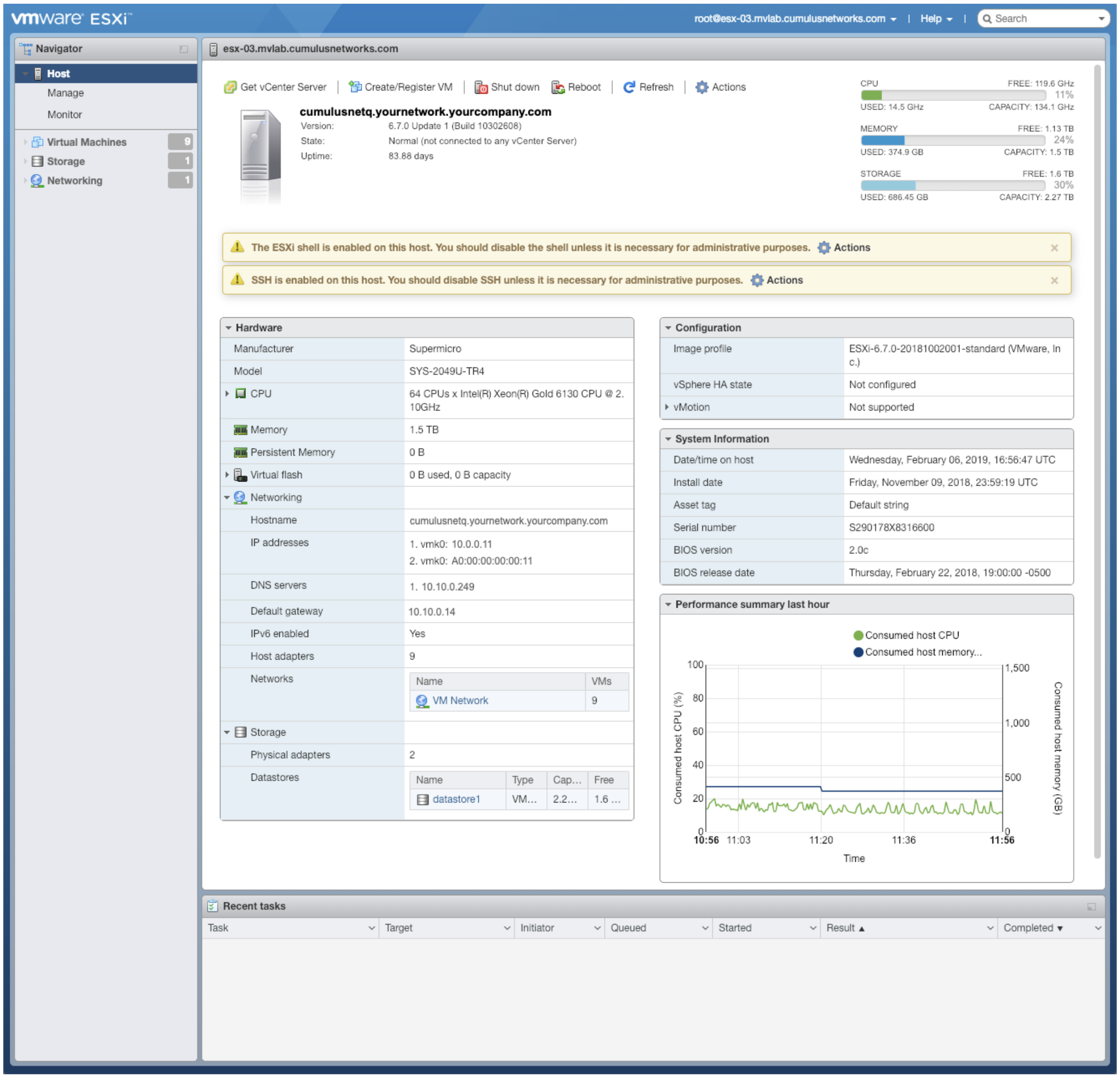
Review your settings selection before finishing the wizard

Product	cumulus-netq-server-2.0.0-ts-amd64-1549014926.f81c23ez8186ae7
VM Name	Cumulus NetQ
Disks	cumulus-netq-server-2.0.0-ts-amd64-1549014926.f81c23ez8186ae7-disk1.vmdk
Datastore	datastore1
Provisioning type	Thin
Network mappings	VM Network: VM Network
Guest OS Name	Unknown

Do not refresh your browser while this VM is being deployed.

The progress of the request is shown in the Recent Tasks window at the bottom of the application. This may take some time, so continue with your other work until the upload finishes.

12. Once completed, view the full details of the VM and hardware.



cumulusnetq.yournetwork.yourcompany.com

Version: 6.7.0 Update 1 (Build 10302608)
State: Normal (not connected to any vCenter Server)
Uptime: 83.88 days

CPU FREE: 119.6 GHz 11% USED: 14.5 GHz CAPACITY: 134.1 GHz
MEMORY FREE: 1.13 TB 24% USED: 374.9 GB CAPACITY: 1.5 TB
STORAGE FREE: 1.6 TB 30% USED: 686.45 GB CAPACITY: 2.27 TB

The ESXi shell is enabled on this host. You should disable the shell unless it is necessary for administrative purposes. Actions

SSH is enabled on this host. You should disable SSH unless it is necessary for administrative purposes. Actions

Hardware	
Manufacturer	Supermicro
Model	SYS-2049U-TR4
CPU	64 CPUs x Intel(R) Xeon(R) Gold 6130 CPU @ 2.10GHz
Memory	1.5 TB
Persistent Memory	0 B
Virtual flash	0 B used, 0 B capacity
Networking	
Hostname	cumulusnetq.yournetwork.yourcompany.com
IP addresses	1. vmk0: 10.0.0.11 2. vmk0: A0:00:00:00:00:11
DNS servers	1. 10.10.0.249
Default gateway	10.10.0.14
IPv6 enabled	Yes
Host adapters	9
Networks	Name: VM Network, VMs: 9
Storage	
Physical adapters	2
Datastores	Name: datastore1, Type: VM..., Cap...: 2.2..., Free: 1.6 ...

Configuration	
Image profile	ESXi-6.7.0-20181002001-standard (VMware, Inc.)
vSphere HA state	Not configured
vMotion	Not supported

System Information	
Date/time on host	Wednesday, February 06, 2019, 16:56:47 UTC
Install date	Friday, November 09, 2018, 23:59:19 UTC
Asset tag	Default string
Serial number	S290178X8316600
BIOS version	2.0c
BIOS release date	Thursday, February 22, 2018, 19:00:00 -0500

Performance summary last hour

KVM example

This example shows the VM setup process for a system with Libvirt and KVM/QEMU installed.

1. Confirm that the SHA256 checksum matches the one posted on the Cumulus Downloads website to ensure the image download has not been corrupted.

```
$ sha256sum ./Downloads/cumulus-netq-server-2.1.1-ts-amd64-qemu.
qcow2
$
6fff5f2ac62930799b4e8cc7811abb6840b247e2c9e76ea9ccba03f991f42424
./Downloads/cumulus-netq-server-2.1.1-ts-amd64-qemu.qcow2
```

2. Copy the QCOW2 image to a directory where you want to run it.

> Copy, instead of moving, the original QCOW2 image that was downloaded to avoid re-downloading it again later should you need to perform this process again.

```
$ sudo mkdir /vms
$ sudo cp ./Downloads/cumulus-netq-server-2.1.1-ts-amd64-qemu.
qcow2 /vms/ts.qcow2
```

3. Create the VM.

   For a Direct VM, where the VM uses a MACVLAN interface to sit on the host interface for its connectivity:

   ```
   $ virt-install --name=netq_ts --vcpus=8 --memory=65536 --os-
   type=linux --os-variant=debian7 \
    --disk path=/vms/ts.qcow2,format=qcow2,bus=virtio,cache=none \
    --network=type=direct,source=eth0,model=virtio --import --
   noautoconsole
   ```

   > Replace the disk path value with the location where the QCOW2 image is to reside. Replace network model value (eth0 in the above example) with the name of the interface where the VM is connected to the external network.

   Or, for a Bridged VM, where the VM attaches to a bridge which has already been setup to allow for external access:

   ```
   $ virt-install --name=netq_ts --vcpus=8 --memory=65536 --os-
   type=linux --os-variant=debian7 \
    --disk path=/vms/ts.qcow2,format=qcow2,bus=virtio,cache=none \
    --network=bridge=br0,model=virtio --import --noautoconsole
   ```

   > Replace network bridge value (br0 in the above example) with the name of the (pre-existing) bridge interface where the VM is connected to the external network.

4. Watch the boot process in another terminal window.

   ```
   $ virsh console netq_ts
   ```

5. From the Console of the VM, check to see which IP address Eth0 has obtained via DHCP, or alternatively set a static IP address with NCLU on the NetQ Appliance or Platform VM.

   ```
   $ ip addr show eth0
   ```

```
$ net add interface eth0 ip address 10.0.0.1
$ net commit
```

⚠ If you have changed the IP Address of the NetQ Platform, you need to re-register this address with the Kubernetes containers before you can continue.

1. Reset all Kubernetes administrative settings. Run the command twice to make sure all directories and files have been reset.

   ```
   cumulus@switch:~$ sudo kubeadm reset -f
   cumulus@switch:~$ sudo kubeadm reset -f
   ```

2. Remove the Kubernetes configuration.
   `cumulus@switch:~$ sudo rm /home/cumulus/.kube/config`
3. Reset the NetQ Platform install daemon.
   `cumulus@switch:~$ sudo systemctl reset-failed`
4. Reset the Kubernetes service.
   `cumulus@switch:~$ sudo systemctl restart cts-kubectl-config`
   ***Note**: Allow 15 minutes for the prompt to return.*
5. Reboot the VM.
   ***Note**: Allow 5-10 minutes for the VM to boot.*

Verify the Installation

1. Verify you can access the NetQ CLI.
   a. From a terminal window, log in to the NetQ Platform using the default credentials (*cumulus /CumulusLinux!*).

   ```
   <computer>:~<username>$ ssh cumulus@<netq-platform-ipaddress>
   Warning: Permanently added '<netq-platform-hostname>,
   192.168.1.254' (ECDSA) to the list of known hosts.
   cumulus@<netq-platform-hostname>'s password: <enter
   CumulusLinux! here>

   Welcome to Cumulus (R) Linux (R)

   For support and online technical documentation, visit
   http://www.cumulusnetworks.com/support

   The registered trademark Linux (R) is used pursuant to a
   sublicense from LMI,
   the exclusive licensee of Linus Torvalds, owner of the mark
   on a world-wide
   basis.

   cumulus@<netq-platform-hostname>:~$
   ```

b. Run the following command to verify all applications are operating properly. ***Note***: *Please allow 10-15 minutes for all applications to come up and report their status.*

```
cumulus@<netq-platform-hostname>:~$ netq show opta-health
Application                    Status    Health    Kafka
Stream    Git Hash    Timestamp
-----------------------------  --------  --------
--------------  ----------  ------------------------
netq-app-macfdb                UP        true
up              14b42e6     Mon Jun  3 20:20:35 2019
netq-app-interface             UP
true                      0fe11c6     Mon Jun  3 20:20:34
2019
netq-app-vlan                  UP
true                      4daed85     Mon Jun  3 20:20:35
2019
netq-app-sensors               UP        true
up              f37272c     Mon Jun  3 20:20:34 2019
netq-app-topology              UP
true                      3f4a887     Mon Jun  3 20:20:34
2019
kafka-broker
UP                                              Mon Jun  3
20:20:35 2019
netq-app-mstpinfo              UP        true
up              ef5565d     Mon Jun  3 20:20:35 2019
netq-app-address               UP        true
up              7e0d03d     Mon Jun  3 20:20:35 2019
netq-gui
UP                                              Mon Jun  3
20:20:35 2019
netq-app-kube                  UP        true
up              fbcaa9d     Mon Jun  3 20:20:34 2019
netq-app-link                  UP        true
up              6c2b21a     Mon Jun  3 20:20:35 2019
netq-app-ptm                   UP        true
up              7162771     Mon Jun  3 20:20:34 2019
netq-opta                      UP
true                                  Mon Jun  3 20:20:34
2019
netq-app-clagsession           UP        true
up              356dda9     Mon Jun  3 20:20:34 2019
netq-endpoint-gateway          UP
true                      295e9ed     Mon Jun  3 20:20:34
2019
netq-app-ospf                  UP        true
up              e0e2ab0     Mon Jun  3 20:20:34 2019
netq-app-lldp                  UP        true
up              90582de     Mon Jun  3 20:20:35 2019
```

```
netq-app-inventory             UP        true
up              bbf9938     Mon Jun  3 20:20:34 2019
netq-app-tracecheck-scheduler  UP
true                      5484c68     Mon Jun  3 20:20:34
2019
netq-app-infra                 UP        true
up              13f9e7c     Mon Jun  3 20:20:34 2019
kafka-connect
UP                                              Mon Jun  3
20:20:35 2019
netq-app-search                UP        true
up              e47aaba     Mon Jun  3 20:20:34 2019
netq-app-procdevstats          UP        true
up              b8e280e     Mon Jun  3 20:20:34 2019
netq-app-vxlan                 UP        true
up              123c577     Mon Jun  3 20:20:34 2019
zookeeper
UP                                              Mon Jun  3
20:20:35 2019
netq-app-resource-util         UP        true
up              41dfb07     Mon Jun  3 20:20:34 2019
netq-app-evpn                  UP        true
up              05a4003     Mon Jun  3 20:20:34 2019
netq-api-gateway               UP
true                      c40231a     Mon Jun  3 20:20:34
2019
netq-app-port                  UP        true
up              4592b70     Mon Jun  3 20:20:35 2019
netq-app-macs                  UP
true                      dd6cd96     Mon Jun  3 20:20:35
2019
netq-app-notifier              UP        true
up              da57b69     Mon Jun  3 20:20:35 2019
netq-app-events                UP        true
up              8f7b4d9     Mon Jun  3 20:20:34 2019
netq-app-services              UP        true
up              5094f4a     Mon Jun  3 20:20:34 2019
cassandra
UP                                              Mon Jun  3
20:20:35 2019
netq-app-configdiff            UP        true
up              3be2ef1     Mon Jun  3 20:20:34 2019
netq-app-neighbor              UP        true
up              9ebe479     Mon Jun  3 20:20:35 2019
netq-app-bgp                   UP        true
up              e68f7a8     Mon Jun  3 20:20:35 2019
schema-registry
UP                                              Mon Jun  3
20:20:35 2019
netq-app-lnv                   UP        true
up              a9ca80a     Mon Jun  3 20:20:34 2019
```

```
netq-app-healthdashboard       UP
true                      eea044c     Mon Jun  3 20:20:34
2019
netq-app-ntp                   UP         true
up              651c86f     Mon Jun  3 20:20:35 2019
netq-app-customermgmt          UP
true                      7250354     Mon Jun  3 20:20:34
2019
netq-app-node                  UP         true
up              f676c9a     Mon Jun  3 20:20:34 2019
netq-app-route                 UP         true
up              6e31f98     Mon Jun  3 20:20:35 2019

cumulus@<netq-platform-hostname>:~$
```

> If any of the applications or services display Status as DOWN after 30 minutes, open a support ticket and attach the output of the `opta-support` command.

2. Verify that NTP is configured and running. NTP operation is critical to proper operation of NetQ. Refer to Setting Date and Time in the *Cumulus Linux User Guide* for details and instructions.
3. Continue the NetQ installation by loading the NetQ Agent on each switch or host you want to monitor. Refer to the next section for instructions.

Upgrade the NetQ Agent

The NetQ Agent must be updated on each node you want to monitor. The node can be a:

- Switch running Cumulus Linux version 3.3.2 or later
- Server running Red Hat RHEL 7.1, Ubuntu 16.04 or CentOS 7
- Linux virtual machine running any of the above Linux operating systems

To upgrade the NetQ Agent you need to install the OS-specific meta package, `cumulus-netq`, on each switch. Optionally, you can install it on hosts. The meta package contains the NetQ Agent, the NetQ command line interface (CLI), and the NetQ library. The library contains modules used by both the NetQ Agent and the CLI.

Instructions for installing the meta package on each node type are included here:

- Upgrade NetQ Agent on a Cumulus Linux Switch (see page 97)
- Upgrade NetQ Agent on an Ubuntu Server (see page 98)
- Upgrade NetQ Agent on a Red Hat or CentOS Server (see page 100)

> If your network uses a proxy server for external connections, you should first configure a global proxy so `apt-get` can access the meta package on the Cumulus Networks repository.

Upgrade NetQ Agent on a Cumulus Linux Switch

A simple process installs the NetQ Agent on a Cumulus switch.

1. Stop the `netq-agent` service and `netqd` daemon running on your switch.

   ```
   cumulus@switch:~$ sudo systemctl stop netq-agent
   cumulus@switch:~$ sudo systemctl stop netqd
   ```

   > If you are running VRF, run these additional commands:
   >
   > ```
   > cumulus@switch:~$ sudo systemctl stop netq-agent@mgmt
   > cumulus@switch:~$ sudo systemctl stop netqd@mgmt
   > ```

2. Remove the older NetQ packages.

   ```
   cumulus@switch:~$ sudo apt -y purge cumulus-netq netq-agent netq-apps python-netq-lib
   ```

3. Verify you have removed all older NetQ packages. You should not see any older version files after running the `dpkg` command here.

   ```
   cumulus@switch:~# dpkg -l | grep netq
   ```

4. Edit the `/etc/apt/sources.list` file to add the repository for Cumulus NetQ. ***Note*** *that NetQ has a separate repository from Cumulus Linux.*

   ```
   cumulus@switch:~$ sudo nano /etc/apt/sources.list
   ...
   deb http://apps3.cumulusnetworks.com/repos/deb CumulusLinux-3 netq-2.2
   ...
   ```

   > The repository `deb http://apps3.cumulusnetworks.com/repos/deb CumulusLinux-3 netq-latest` can be used if you want to always retrieve the latest posted version of NetQ.

5. Update the local `apt` repository, then install the NetQ meta package on the switch.

   ```
   cumulus@switch:~$ sudo apt-get update
   ```

```
cumulus@switch:~$ sudo apt-get install cumulus-netq
```

6. Restart `rsyslog` so log files are sent to the correct destination.

```
cumulus@switch:~$ sudo systemctl restart rsyslog.service
```

7. Configure the NetQ Agent to send telemetry data to the NetQ Platform and, optionally, configure the switch or host to run the NetQ CLI. In this example, the IP address for the agent and cli servers is *192.168.1.254*.
   Note: If you intend to use VRF, skip to Configure the Agent to Use VRF (see page 102). If you intend to specify a port for communication, skip to Configure the Agent to Communicate over a Specific Port (see page 102).

```
cumulus@switch:~$ netq config add agent server 192.168.1.254
cumulus@switch:~$ netq config add cli server 192.168.1.254
```

   This command updates the configuration in the `/etc/netq/netq.yml` file and enables the NetQ CLI.

8. Restart NetQ Agent and CLI.

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

Repeat these steps for each Cumulus switch, or use an automation tool to install NetQ Agent on multiple Cumulus Linux switches.

Upgrade NetQ Agent on an Ubuntu Server (Optional)

To upgrade the NetQ Agent on an Ubuntu server:

1. Remove the current NetQ Agent and application software from your switch or host.

```
root@ubuntu:~# sudo systemctl stop netq-agent
root@ubuntu:~# sudo systemctl stop netqd
root@ubuntu:~# sudo apt-get purge --auto-remove cumulus-netq
netq-agent netq-apps python-netq-lib
```

2. Verify you have removed all older NetQ packages. You should not see any older version files.

```
root@ubuntu:~# dpkg -l | grep netq
```

3. Reference and update the local `apt` repository.

```
root@ubuntu:~# wget -O- https://apps3.cumulusnetworks.com/setup
/cumulus-apps-deb.pubkey | apt-key add -
```

4. In `/etc/apt/sources.list.d/cumulus-host-ubuntu-xenial.list`, verify the following repository is included:

```
root@ubuntu:~# vi /etc/apt/sources.list.d/cumulus-apps-deb-
xenial.list
...
deb [arch=amd64] https://apps3.cumulusnetworks.com/repos/deb
xenial netq-latest
...
```

> ⚠ The use of `netq-latest` in this example means that a `get` to the repository always retrieves the latest version of NetQ, even in the case where a major version update has been made. If you want to keep the repository on a specific version — such as `netq-2.2` — use that instead.

5. Verify NTP is operating correctly. Look for an asterisk (*) or a plus sign (+) that indicates the clock is synchronized.

```
root@ubuntu:~# ntpq -pn
     remote           refid      st t when poll reach   delay
offset  jitter
=================================================================
=============
+173.255.206.154 132.163.96.3     2 u   86  128  377   41.354
2.834   0.602
+12.167.151.2    198.148.79.209   3 u  103  128  377   13.395
-4.025   0.198
 2a00:7600::41   .STEP.          16 u    - 1024    0    0.000
0.000   0.000
*129.250.35.250  249.224.99.213   2 u  101  128  377   14.588
-0.299   0.243
```

6. Install the meta package on the server.

```
root@ubuntu:~# apt-get update
root@ubuntu:~# apt-get install cumulus-netq
```

7. Configure the NetQ Agent to send telemetry data to the NetQ Platform.

```
user@ubuntu:~# netq config add agent server <netq-platform-ip-
address>
```

```
Updated agent server 192.168.1.254 vrf default. Please restart
netq-agent (netq config restart agent).
```

8. Restart the NetQ Agent

```
user@ubuntu:~# netq config restart agent
```

9. Optionally, configure the Ubuntu server to run the NetQ CLI.

```
user@ubuntu:~# netq config add cli server <netq-platform-ip-
address>
Updated cli server 192.168.1.254 vrf default. Please restart
netqd (netq config restart cli).
```

10. Restart the CLI.

```
user@ubuntu:~# netq config restart cli
```

Upgrade NetQ Agent on a Red Hat or CentOS Server (Optional)

To upgrade the NetQ Agent on a Red Hat or CentOS server:

1. Remove the current NetQ Agent and application software from your switch or host.

```
root@rhel7:~# sudo systemctl stop netq-agent
root@rhel7:~# sudo systemctl stop netqd
root@rhel7:~# yum remove netq-apps netq-agent cumulus-netq
```

2. Verify you have removed all older NetQ packages. You should not see any older version files.

```
root@rhel7:~# yum list | grep netq
```

3. Reference and update the local `yum` repository.

```
root@rhel7:~# rpm --import https://apps3.cumulusnetworks.com
/setup/cumulus-apps-rpm.pubkey
root@rhel7:~# wget -O- https://apps3.cumulusnetworks.com/setup
/cumulus-apps-rpm-el7.repo > /etc/yum.repos.d/cumulus-host-el.
repo
```

4. Edit `/etc/yum.repos.d/cumulus-host-el.repo` to set the `enabled=1` flag for the two NetQ repositories.

```
root@rhel7:~# vi /etc/yum.repos.d/cumulus-host-el.repo
...
[cumulus-arch-netq-2.2]
name=Cumulus netq packages
baseurl=https://apps3.cumulusnetworks.com/repos/rpm/el/7/netq-2.2
/$basearch
gpgcheck=1
enabled=1
[cumulus-noarch-netq-2.2]
name=Cumulus netq architecture-independent packages
baseurl=https://apps3.cumulusnetworks.com/repos/rpm/el/7/netq-2.2
/noarch
gpgcheck=1
enabled=1
...
```

5. Verify NTP is operating correctly. Look for an asterisk (*) or a plus sign (+) that indicates the clock is synchronized.

```
root@rhel7:~# ntpq -pn
     remote           refid      st t when poll reach   delay
offset  jitter
=================================================================
=============
+173.255.206.154 132.163.96.3     2 u   86  128  377   41.354
2.834   0.602
+12.167.151.2    198.148.79.209   3 u  103  128  377   13.395
-4.025   0.198
 2a00:7600::41   .STEP.          16 u    - 1024    0    0.000
0.000   0.000
*129.250.35.250  249.224.99.213   2 u  101  128  377   14.588
-0.299   0.243
```

6. Update the NetQ meta packages on the server.

```
root@rhel7:~# yum update cumulus-netq.x86_64
```

7. Configure the NetQ Agent to send telemetry data to the NetQ Platform.

```
root@rhel7:~# netq config add agent server <netq-platform-ip-
address>
Updated agent server 192.168.1.254 vrf default. Please restart
netq-agent (netq config restart agent).
```

8. Restart the NetQ Agent.

```
root@rhel7:~# netq config restart agent
```

9. Optionally, configure the RHEL/CentOS server to run the NetQ CLI.

```
root@rhel7:~# netq config add cli server <netq-platform-ip-
address>
Updated cli server 192.168.1.254 vrf default. Please restart
netqd (netq config restart cli).
```

10. Restart the CLI.

```
root@rhel7:~# netq config restart cli
```

Configure Optional NetQ Agent Settings

Once the NetQ Agents have been installed on the network nodes you want to monitor, the NetQ Agents must be configured to obtain useful and relevant data. The code examples shown in this section illustrate how to configure the NetQ Agent on a Cumulus switch, but it is exactly the same for the other type of nodes. Depending on your deployment, follow the relevant additional instructions after the basic configuration steps:

- Configuring the Agent to Use a VRF (see page 102)
- Configuring the Agent to Communicate over a Specific Port (see page 102)

Configure the Agent to Use a VRF

While optional, Cumulus strongly recommends that you configure NetQ Agents to communicate with the NetQ Platform only via a VRF, including a management VRF. To do so, you need to specify the VRF name when configuring the NetQ Agent. For example, if the management VRF is configured and you want the agent to communicate with the NetQ Platform over it, configure the agent like this:

```
cumulus@leaf01:~$ netq config add agent server 192.168.1.254 vrf mgmt
cumulus@leaf01:~$ netq config add cli server 192.168.254 vrf mgmt
```

You then restart the agent:

```
cumulus@leaf01:~$ netq config restart agent
cumulus@leaf01:~$ netq config restart cli
```

Configure the Agent to Communicate over a Specific Port

By default, NetQ uses port 8981 for communication between the NetQ Platform and NetQ Agents. If you want the NetQ Agent to communicate with the NetQ Platform via a different port, you need to specify the port number when configuring the NetQ Agent like this:

```
cumulus@leaf01:~$ netq config add agent server 192.168.1.254 port 7379
```

You then restart the agent:

```
cumulus@leaf01:~$ netq config restart agent
```

Integrate with Event Notification Tools

If you want to proactively monitor events in your network, you can integrate NetQ with the PagerDuty or Slack notification tools. To do so you need to configure both the notification application itself to receive the messages, and NetQ with what messages to send and where to send them. Refer to Integrate NetQ with Event Notification Applications (see page 52) to use the CLI for configuration.

Set Up Security

When you set up and configured your Cumulus Linux switches, you likely configured a number of the security features available. Cumulus recommends the same security measures be followed for the NetQ Platform in the out-of-band-network. Refer to the Securing Cumulus Linux white paper for details.

Your Cumulus Linux switches have a number of ports open by default. A few additional ports must be opened to run the NetQ software (refer to Default Open Ports in Cumulus Linux and NetQ article).

Upgrade from NetQ 2.0/2.1 to NetQ 2.2.x

This document describes the steps required to upgrade from all NetQ 2.0 and NetQ 2.1 releases to NetQ 2.2.x.

> ⓘ Cumulus Networks recommends only upgrading NetQ during a network maintenance window.
>
> Any data you have collected while using NetQ 2.1.0 is maintained during this upgrade process.

> ⚠ Events generated during the upgrade process will not be available in the database. Once the upgrade process is complete, the agents re-sync with the current state of the Host or Cumulus Linux switch with the NetQ Platform.

To upgrade from NetQ 1.x to NetQ 2.2.x, please follow the instructions here (see page 81). Instructions for installing NetQ 2.2.x for the first time can be found here (see page 29).

Contents

This topic describes how to...

Prerequisites

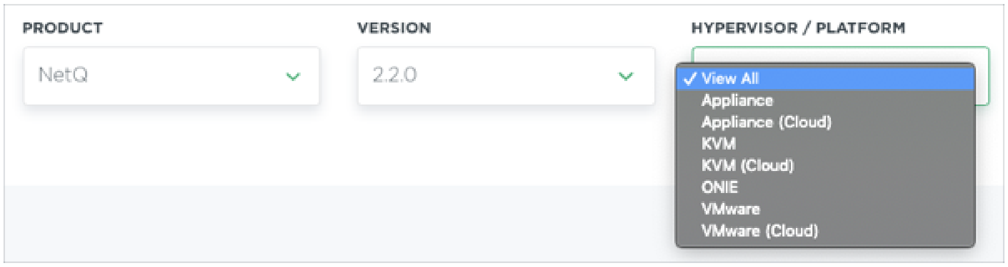
Before you begin the upgrade process, please note the following:

- The minimum supported Cumulus Linux version for NetQ 2.2.x is 3.3.2.
- You must upgrade your NetQ Agents as well as the NetQ Platform.
- You can upgrade to NetQ 2.2.x without upgrading Cumulus Linux.
- The NetQ installer pod `netq-installer` should be up in either the *Containercreating* or *Running* state. The `netq-installer` pod state could also be *ContainerCreating*, in which case the host is initializing with the SSH keys.

Upgrade the NetQ Platform

To upgrade the NetQ Platform:

1. Download the NetQ Platform VM upgrade image.
   a. On the Cumulus Downloads page, select *NetQ* from the **Product** list box.
   b. Click *2.2* from the **Version** list box, and then select *2.2.x* from the submenu.
   c. Optionally, select the hypervisor you wish to use (*VMware, VMware (cloud), KVM,* or *KVM (cloud)*) from the **Hypervisor/Platform** list box.
   Note: You can ignore the ONIE and Appliance options, as they are for the NetQ appliances.

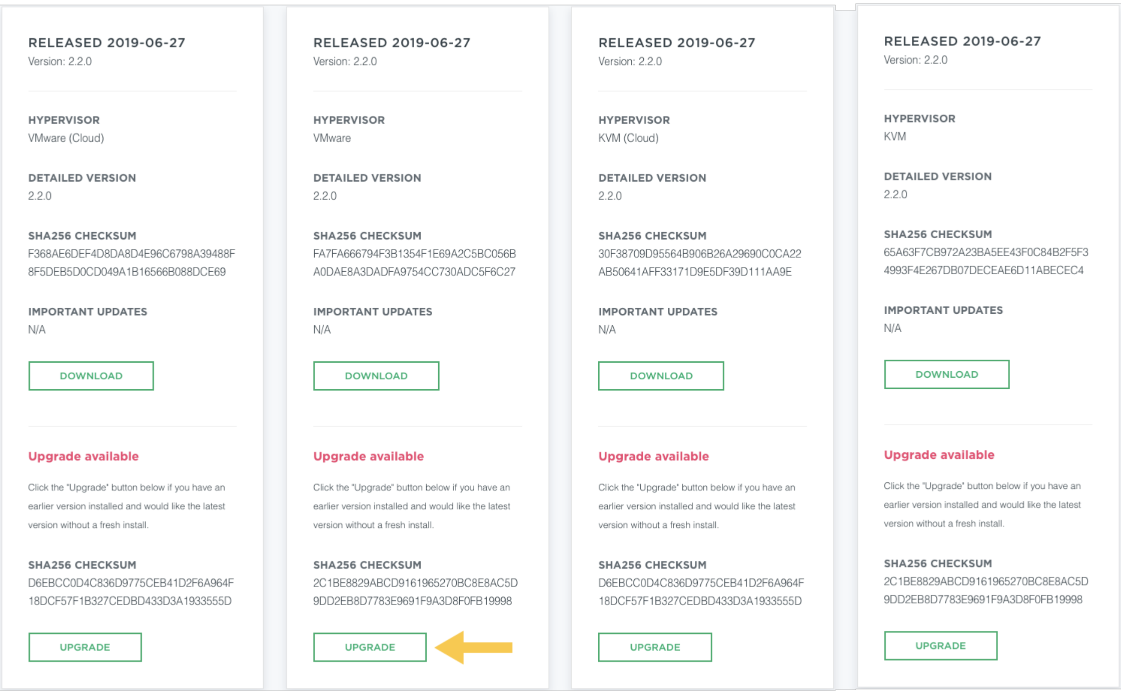


PRODUCT
NetQ

VERSION
2.2.0

HYPERVISOR / PLATFORM
✓ View All
Appliance
Appliance (Cloud)
KVM
KVM (Cloud)
ONIE
VMware
VMware (Cloud)

   d. Scroll down to review the images that match your selection criteria.



RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
VMware (Cloud)

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
F368AE6DEF4D8DA8D4E96C6798A39488F
8F5DEB5D0CD049A1B16566B088DCE69

IMPORTANT UPDATES
N/A

DOWNLOAD

Upgrade available

Click the "Upgrade" button below if you have an earlier version installed and would like the latest version without a fresh install.

SHA256 CHECKSUM
D6EBCC0D4C836D9775CEB41D2F6A964F
18DCF57F1B327CEDBD433D3A1933555D

UPGRADE

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
VMware

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
FA7FA666794F3B1354F1E69A2C5BC056B
A0DAE8A3DADFA9754CC730ADC5F6C27

IMPORTANT UPDATES
N/A

DOWNLOAD

Upgrade available

Click the "Upgrade" button below if you have an earlier version installed and would like the latest version without a fresh install.

SHA256 CHECKSUM
2C1BE8829ABCD9161965270BC8E8AC5D
9DD2EB8D7783E9691F9A3D8F0FB19998

UPGRADE

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
KVM (Cloud)

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
30F38709D95564B906B26A29690C0CA22
AB50641AFF33171D9E5DF39D111AA9E

IMPORTANT UPDATES
N/A

DOWNLOAD

Upgrade available

Click the "Upgrade" button below if you have an earlier version installed and would like the latest version without a fresh install.

SHA256 CHECKSUM
D6EBCC0D4C836D9775CEB41D2F6A964F
18DCF57F1B327CEDBD433D3A1933555D

UPGRADE

RELEASED 2019-06-27
Version: 2.2.0

HYPERVISOR
KVM

DETAILED VERSION
2.2.0

SHA256 CHECKSUM
65A63F7CB972A23BA5EE43F0C84B2F5F3
4993F4E267DB07DECEAE6D11ABECEC4

IMPORTANT UPDATES
N/A

DOWNLOAD

Upgrade available

Click the "Upgrade" button below if you have an earlier version installed and would like the latest version without a fresh install.

SHA256 CHECKSUM
2C1BE8829ABCD9161965270BC8E8AC5D
9DD2EB8D7783E9691F9A3D8F0FB19998

UPGRADE

   e. Click **Upgrade** for the relevant version, being careful to select the correct deployment version.

2. From a terminal window, log in to the NetQ Platform using your login credentials. This example uses the default *cumulus/CumulusLinux!* credentials.

```
<computer>:~<username>$ ssh cumulus@netq-platform
cumulus@netq-platform's password:
cumulus@netq-platform:~$
```

3. Change to the root user.

   ```
   cumulus@netq-platform:~$ sudo -i
   [sudo] password for cumulus:
   root@netq-platform:~#
   ```

4. Create an *installables* subdirectory in the mount directory.

   ```
   root@netq-platform:~# mkdir -p /mnt/installables/
   root@netq-platform:~#
   ```

5. Copy the upgrade image file into your new directory. The on-site file is named `NetQ-2.2.0.tgz` and the cloud file is named `NetQ-2.2.0-opta.tgz`.

   ```
   root@netq-platform:~# cd /mnt/installables/
   root@netq-platform:/mnt/installables# cp /home/usr/dir/<NetQ-image>.tgz ./
   ```

6. Export the installer script.

   ```
   root@netq-platform:/mnt/installables# tar -xvf <NetQ-image>.tgz ./netq-install.sh
   ```

7. Verify the contents of the directory. You should have the image file and the `netq-install.sh` script.

   ```
   root@netq-platform:/mnt/installables# ls -l
   total 9607744
   -rw-r--r-- 1 cumulus cumulus 5911383922 Apr 23 11:13 <NetQ-image>.tgz
   -rwxr-xr-x 1 _lldpd _lldpd 4309 Apr 23 10:34 netq-install.sh
   root@netq-appliance:/mnt/installables#
   ```

8. Configure SSH access.

   > ⓘ If you perform the upgrade more than once, you can skip this step after performing it once.
   >
   > If you have an existing SSH key, skip to step 8c.

   a. Generate the SSH key to enable you to run the script.

      > ⓘ Leave the passphrase blank to simplify running the script.

```
root@netq-platform:/mnt/installables# ssh-keygen -t rsa -b
4096
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
Created directory '/root/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /root/.ssh/id_rsa.
Your public key has been saved in /root/.ssh/id_rsa.pub.
```

b. Copy the key to the `authorized_keys` directory.

```
root@netq-platform:/mnt/installables# cat ~/.ssh/id_rsa.pub
>> ~/.ssh/authorized_keys
root@netq-platform:/mnt/installables# chmod 0600 ~/.ssh
/authorized_keys
root@netq-platform:/mnt/installables#
```

c. Associate the key with the installer.

```
root@netq-platform:/mnt/installables/# ./netq-install.sh --
usekey ~/.ssh/id_rsa
[Fri 21 Jun 2019 06:34:47 AM UTC] - This Script can only be
invoked by user: root
[Fri 21 Jun 2019 06:34:47 AM UTC] - The logged in user is
root
[Fri 21 Jun 2019 06:34:47 AM UTC] - Install directory /mnt
/installables exists on system.
[Fri 21 Jun 2019 06:34:47 AM UTC] - File /root/.ssh/id_rsa
exists on system...
[Fri 21 Jun 2019 06:34:47 AM UTC] - checking the presence
of existing instaler-ssh-keys secret/instaler-ssh-keys
created
[Fri 21 Jun 2019 06:34:48 AM UTC] - Unable to find netq-
installer up and running. Sleeping for 10 seconds ...
[Fri 21 Jun 2019 06:34:58 AM UTC] - Unable to find netq-
installer up and running. Sleeping for 10 seconds ...
[Fri 21 Jun 2019 06:35:08 AM UTC] - Able to find the netq-
installer up and running...
```

9. Upgrade the NetQ software. This example shows an upgrade to version 2.2.0, on-site deployment.

```
root@netq-platform:/mnt/installables# ./netq-install.sh  --
installbundle  /mnt/installables/NetQ-2.2.0.tgz --updateapps
```

```
[Fri 21 Jun 2019 08:18:37 PM UTC] - File /mnt/installables/NetQ-
2.2.0.tgz exists on system for updating netq-installer ...
[Fri 21 Jun 2019 08:18:37 PM UTC] - Check the netq-installer is
up and running to process requests ....
[Fri 21 Jun 2019 08:18:37 PM UTC] - Checking the Status of netq-
installer ....
[Fri 21 Jun 2019 08:18:37 PM UTC] - The netq-installer is up and
running ...
[Fri 21 Jun 2019 08:18:37 PM UTC] - Updating the netq-installer
...
[Fri 21 Jun 2019 08:18:37 PM UTC] - Able to execute the command
for updating netq-installer ...
[Fri 21 Jun 2019 08:18:37 PM UTC] - Checking initialization of
netq-installer update ...
[Fri 21 Jun 2019 08:18:37 PM UTC] - Update of netq-installer is
in progress ...
******************************0
[Fri 21 Jun 2019 08:28:39 PM UTC] - Successfully updated netq
installer....
0,/mnt/installables/NetQ-2.2.0.tgz
[Fri 21 Jun 2019 08:28:39 PM UTC] - File /mnt/installables/NetQ-
2.2.0.tgz exists on system for updating netq apps...
[Fri 21 Jun 2019 08:28:39 PM UTC] - User selected to update netq-
apps ...
[Fri 21 Jun 2019 08:28:39 PM UTC] - Checking the Status of netq-
installer ....
[Fri 21 Jun 2019 08:28:41 PM UTC] - Unable to find netq-
installer up and running. Sleeping for 10 seconds ...
[Fri 21 Jun 2019 08:28:52 PM UTC] - Unable to find netq-
installer up and running. Sleeping for 10 seconds ...
[Fri 21 Jun 2019 08:29:03 PM UTC] - Unable to find netq-
installer up and running. Sleeping for 10 seconds ...
[Fri 21 Jun 2019 08:29:14 PM UTC] - Unable to find netq-
installer up and running. Sleeping for 10 seconds ...
[Fri 21 Jun 2019 08:29:24 PM UTC] - The netq-installer is up and
running ...
[Fri 21 Jun 2019 08:29:24 PM UTC] - Able to execute the command
for netq apps updates ...
[Fri 21 Jun 2019 08:29:24 PM UTC] - Checking initialization of
apps update ...
[Fri 21 Jun 2019 08:29:29 PM UTC] - netq apps update is in
progress ...
******************************************************************
******************************************************************
**
******************************************************************
******************************************************************
*********************************************

0
[Fri 21 Jun 2019 09:20:31 PM UTC] - Successfully updated netq
apps ....
root@netq-appliance:/mnt/installables#
```

ⓘ Please allow about an hour for the upgrade to complete.

⚠ If you have changed the IP Address of the NetQ Platform, you need to re-register this address with the Kubernetes containers before you can continue.

1. Reset all Kubernetes administrative settings. Run the command twice to make sure all directories and files have been reset.

   ```
   cumulus@switch:~$ sudo kubeadm reset -f
   cumulus@switch:~$ sudo kubeadm reset -f
   ```

2. Remove the Kubernetes configuration.

   ```
   cumulus@switch:~$ sudo rm /home/cumulus/.kube/config
   ```

3. Reset the NetQ Platform install daemon.

   ```
   cumulus@switch:~$ sudo systemctl reset-failed
   ```

4. Reset the Kubernetes service.

   ```
   cumulus@switch:~$ sudo systemctl restart cts-kubectl-config
   ```

   Note: *Allow 15 minutes for the prompt to return.*

5. Reboot the VM.

   Note: *Allow 5-10 minutes for the VM to boot.*

Verify the Installation

1. Verify you can access the NetQ CLI.
   a. From a terminal window, log in to the NetQ Platform using the default credentials (*cumulus /CumulusLinux!*).

```
<computer>:~<username>$ ssh cumulus@<netq-platform-ipaddress>
Warning: Permanently added '<netq-platform-hostname>,
192.168.1.254' (ECDSA) to the list of known hosts.
cumulus@<netq-platform-hostname>'s password: <enter
CumulusLinux! here>

Welcome to Cumulus (R) Linux (R)

For support and online technical documentation, visit
http://www.cumulusnetworks.com/support

The registered trademark Linux (R) is used pursuant to a
sublicense from LMI,
the exclusive licensee of Linus Torvalds, owner of the mark
on a world-wide
basis.
```

```
cumulus@<netq-platform-hostname>:~$
```

b. Run the following command to verify all applications are operating properly. ***Note****: Please allow 10-15 minutes for all applications to come up and report their status.*

```
cumulus@<netq-platform-hostname>:~$ netq show opta-health
Application                    Status    Health    Kafka
Stream    Git Hash    Timestamp
-----------------------------  --------  --------
--------------  ----------  ------------------------
netq-app-macfdb                UP        true
up              14b42e6     Mon Jun  3 20:20:35 2019
netq-app-interface             UP
true                      0fe11c6     Mon Jun  3 20:20:34
2019
netq-app-vlan                  UP
true                      4daed85     Mon Jun  3 20:20:35
2019
netq-app-sensors               UP        true
up              f37272c     Mon Jun  3 20:20:34 2019
netq-app-topology              UP
true                      3f4a887     Mon Jun  3 20:20:34
2019
kafka-broker
UP                                              Mon Jun  3
20:20:35 2019
netq-app-mstpinfo              UP        true
up              ef5565d     Mon Jun  3 20:20:35 2019
netq-app-address               UP        true
up              7e0d03d     Mon Jun  3 20:20:35 2019
netq-gui
UP                                              Mon Jun  3
20:20:35 2019
netq-app-kube                  UP        true
up              fbcaa9d     Mon Jun  3 20:20:34 2019
netq-app-link                  UP        true
up              6c2b21a     Mon Jun  3 20:20:35 2019
netq-app-ptm                   UP        true
up              7162771     Mon Jun  3 20:20:34 2019
netq-opta                      UP
true                                  Mon Jun  3 20:20:34
2019
netq-app-clagsession           UP        true
up              356dda9     Mon Jun  3 20:20:34 2019
netq-endpoint-gateway          UP
true                      295e9ed     Mon Jun  3 20:20:34
2019
netq-app-ospf                  UP        true
up              e0e2ab0     Mon Jun  3 20:20:34 2019
```

```
netq-app-lldp                  UP        true
up              90582de     Mon Jun  3 20:20:35 2019
netq-app-inventory             UP        true
up              bbf9938     Mon Jun  3 20:20:34 2019
netq-app-tracecheck-scheduler  UP
true                      5484c68     Mon Jun  3 20:20:34
2019
netq-app-infra                 UP        true
up              13f9e7c     Mon Jun  3 20:20:34 2019
kafka-connect
UP                                              Mon Jun  3
20:20:35 2019
netq-app-search                UP        true
up              e47aaba     Mon Jun  3 20:20:34 2019
netq-app-procdevstats          UP        true
up              b8e280e     Mon Jun  3 20:20:34 2019
netq-app-vxlan                 UP        true
up              123c577     Mon Jun  3 20:20:34 2019
zookeeper
UP                                              Mon Jun  3
20:20:35 2019
netq-app-resource-util         UP        true
up              41dfb07     Mon Jun  3 20:20:34 2019
netq-app-evpn                  UP        true
up              05a4003     Mon Jun  3 20:20:34 2019
netq-api-gateway               UP
true                      c40231a     Mon Jun  3 20:20:34
2019
netq-app-port                  UP        true
up              4592b70     Mon Jun  3 20:20:35 2019
netq-app-macs                  UP
true                      dd6cd96     Mon Jun  3 20:20:35
2019
netq-app-notifier              UP        true
up              da57b69     Mon Jun  3 20:20:35 2019
netq-app-events                UP        true
up              8f7b4d9     Mon Jun  3 20:20:34 2019
netq-app-services              UP        true
up              5094f4a     Mon Jun  3 20:20:34 2019
cassandra
UP                                              Mon Jun  3
20:20:35 2019
netq-app-configdiff            UP        true
up              3be2ef1     Mon Jun  3 20:20:34 2019
netq-app-neighbor              UP        true
up              9ebe479     Mon Jun  3 20:20:35 2019
netq-app-bgp                   UP        true
up              e68f7a8     Mon Jun  3 20:20:35 2019
schema-registry
UP                                              Mon Jun  3
20:20:35 2019
```

```
netq-app-lnv                   UP        true
up              a9ca80a     Mon Jun  3 20:20:34 2019
netq-app-healthdashboard       UP
true                      eea044c     Mon Jun  3 20:20:34
2019
netq-app-ntp                   UP        true
up              651c86f     Mon Jun  3 20:20:35 2019
netq-app-customermgmt          UP
true                      7250354     Mon Jun  3 20:20:34
2019
netq-app-node                  UP        true
up              f676c9a     Mon Jun  3 20:20:34 2019
netq-app-route                 UP        true
up              6e31f98     Mon Jun  3 20:20:35 2019

cumulus@<netq-platform-hostname>:~$
```

> If any of the applications or services display Status as DOWN after 30 minutes, open a support ticket and attach the output of the `opta-support` command.

2. Verify that NTP is configured and running. NTP operation is critical to proper operation of NetQ. Refer to Setting Date and Time in the *Cumulus Linux User Guide* for details and instructions.
3. Continue the NetQ installation by loading the NetQ Agent on each switch or host you want to monitor. Refer to the next section for instructions.

Upgrade the NetQ Agents

Whether using the NetQ Appliance or your own hardware, the NetQ Agent should be upgraded on each of the existing nodes you want to monitor. The node can be a:

- Switch running Cumulus Linux version 3.3.2 or later
- Server running Red Hat RHEL 7.1, Ubuntu 16.04 or CentOS 7
- Linux virtual machine running any of the above Linux operating systems

To upgrade the NetQ Agent you need to install the OS-specific meta package, `cumulus-netq`, on each switch. Optionally, you can install it on hosts. The meta package contains the NetQ Agent, the NetQ command line interface (CLI), and the NetQ library. The library contains modules used by both the NetQ Agent and the CLI.

- Upgrade NetQ Agent on a Cumulus Linux Switch (see page 112)
- Upgrade NetQ Agent on an Ubuntu Server (see page 114)
- Upgrade NetQ Agent on a Red Hat or CentOS Server (see page 115)

> If your network uses a proxy server for external connections, you should first configure a global proxy , so apt-get can access the meta package on the Cumulus Networks repository.

Upgrade NetQ Agent on a Cumulus Linux Switch

A simple process installs the NetQ Agent on a Cumulus switch.

1. Edit the `/etc/apt/sources.list` file to add the repository for Cumulus NetQ. ***Note** that NetQ has a separate repository from Cumulus Linux.*

   ```
   cumulus@switch:~$ sudo nano /etc/apt/sources.list
   ...
   deb http://apps3.cumulusnetworks.com/repos/deb CumulusLinux-3
   netq-2.2
   ...
   ```

   > The repository `deb http://apps3.cumulusnetworks.com/repos/deb CumulusLinux-3 netq-latest` can be used if you want to always retrieve the latest posted version of NetQ.

2. Update the local `apt` repository, then install the NetQ meta package on the switch.

   ```
   cumulus@switch:~$ sudo apt-get update
   cumulus@switch:~$ sudo apt-get install cumulus-netq
   ```

3. Verify the upgrade.

   ```
   cumulus@switch:~$ dpkg -l | grep netq
   ii  cumulus-netq                      2.2.0-cl3u17~1557345432.
   a60ec9a    all          This meta-package provides installation
   of Cumulus NetQ packages.
   ii  netq-agent                        2.2.0-cl3u17~1559681411.
   2bba220    amd64        Cumulus NetQ Telemetry Agent for Cumulus
   Linux
   ii  netq-apps                         2.2.0-cl3u17~1559681411.
   2bba220    amd64        Cumulus NetQ Fabric Validation
   Application for Cumulus Linux
   ```

4. Restart `rsyslog` so log files are sent to the correct destination.

   ```
   cumulus@switch:~$ sudo systemctl restart rsyslog.service
   ```

5. Configure the NetQ Agent to send telemetry data to the NetQ Platform and, optionally, configure the switch or host to run the NetQ CLI. In this example, the IP address for the agent and cli servers is *192.168.1.254*.
   Note: If you intend to use VRF, skip to Configure the Agent to Use VRF (see page 117). If you intend to specify a port for communication, skip to Configure the Agent to Communicate over a Specific Port (see page 118).

```
cumulus@switch:~$ netq config add agent server 192.168.1.254
cumulus@switch:~$ netq config add cli server 192.168.1.254
```

This command updates the configuration in the `/etc/netq/netq.yml` file and enables the NetQ CLI.

6. Restart NetQ Agent and CLI.

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

Repeat these steps for each Cumulus switch, or use an automation tool to install NetQ Agent on multiple Cumulus Linux switches.

Upgrade NetQ Agent on an Ubuntu Server (Optional)

To install the NetQ Agent on an Ubuntu server:

1. Reference and update the local `apt` repository.

```
root@ubuntu:~# wget -O- https://apps3.cumulusnetworks.com/setup
/cumulus-apps-deb.pubkey | apt-key add -
```

2. In `/etc/apt/sources.list.d/cumulus-host-ubuntu-xenial.list`, verify the following repository is included:

```
root@ubuntu:~# vi /etc/apt/sources.list.d/cumulus-apps-deb-
xenial.list
...
deb [arch=amd64] https://apps3.cumulusnetworks.com/repos/deb
xenial netq-latest
...
```

> ⚠ The use of `netq-latest` in this example means that a `get` to the repository always retrieves the latest version of NetQ, even in the case where a major version update has been made. If you want to keep the repository on a specific version — such as `netq-2.1` — use that instead.

3. Install the meta package on the server.

```
root@ubuntu:~# apt-get update
root@ubuntu:~# apt-get install cumulus-netq
```

4. Verify the upgrade.

```
root@ubuntu:~$ dpkg -l | grep netq
ii  cumulus-netq                      2.2.0-cl3u17~1557345432.
a60ec9a    all          This meta-package provides installation
of Cumulus NetQ packages.
ii  netq-agent                        2.2.0-cl3u17~1559681411.
2bba220    amd64        Cumulus NetQ Telemetry Agent for Cumulus
Linux
ii  netq-apps                         2.2.0-cl3u17~1559681411.
2bba220    amd64        Cumulus NetQ Fabric Validation
Application for Cumulus Linux
```

5. Configure the NetQ Agent to send telemetry data to the NetQ Platform.

```
user@ubuntu:~# netq config add agent server <netq-platform-ip-
address>
Updated agent server 192.168.1.254 vrf default. Please restart
netq-agent (netq config restart agent).
```

6. Restart the NetQ Agent

```
user@ubuntu:~# netq config restart agent
```

7. Optionally, configure the Ubuntu server to run the NetQ CLI.

```
user@ubuntu:~# netq config add cli server <netq-platform-ip-
address>
Updated cli server 192.168.1.254 vrf default. Please restart
netqd (netq config restart cli).
```

8. Restart the CLI.

```
user@ubuntu:~# netq config restart cli
```

9. Repeat these steps for each switch/host running Ubuntu, or use an automation tool to install NetQ Agent on multiple switches/hosts.

Upgrade NetQ Agent on a Red Hat or CentOS Server (Optional)

To install the NetQ Agent on a Red Hat or CentOS server:

1. Reference and update the local `yum` repository.

```
root@rhel7:~# rpm --import https://apps3.cumulusnetworks.com
/setup/cumulus-apps-rpm.pubkey
root@rhel7:~# wget -O- https://apps3.cumulusnetworks.com/setup
/cumulus-apps-rpm-el7.repo > /etc/yum.repos.d/cumulus-host-el.
repo
```

2. Edit `/etc/yum.repos.d/cumulus-host-el.repo` to set the `enabled=1` flag for the two NetQ repositories.

```
[cumulus@firewall-2 ~]$ cat /etc/yum.repos.d/cumulus-host-el.
repo
[cumulus-arch-netq-2.2]
name=Cumulus netq packages
baseurl=http://rohbuild03.mvlab.cumulusnetworks.com/dev/rpm/el/7
/netq-latest/$basearch
gpgcheck=1
enabled=1

[cumulus-noarch-netq-2.2]
name=Cumulus netq architecture-independent packages
baseurl=http://rohbuild03.mvlab.cumulusnetworks.com/dev/rpm/el/7
/netq-latest/noarch
gpgcheck=1
enabled=1

[cumulus-src-netq-2.2]
name=Cumulus netq source packages
baseurl=http://rohbuild03.mvlab.cumulusnetworks.com/dev/rpm/el/7
/netq-latest/src
gpgcheck=1
enabled=1
```

3. Update the NetQ meta packages on the server.

```
root@rhel7:~# yum update cumulus-netq.x86_64
```

4. Verify the upgrade.

```
root@ubuntu:~$ yum list installed | grep netq
ii  cumulus-netq                       2.2.0-cl3u17~1557345432.
a60ec9a    all          This meta-package provides installation
of Cumulus NetQ packages.
ii  netq-agent                         2.2.0-cl3u17~1559681411.
2bba220    amd64        Cumulus NetQ Telemetry Agent for Cumulus
Linux
ii  netq-apps                          2.2.0-cl3u17~1559681411.
2bba220    amd64        Cumulus NetQ Fabric Validation
Application for Cumulus Linux
```

5. Configure the NetQ Agent to send telemetry data to the NetQ Platform.

   ```
   root@rhel7:~# netq config add agent server <netq-platform-ip-
   address>
   Updated agent server 192.168.1.254 vrf default. Please restart
   netq-agent (netq config restart agent).
   ```

6. Restart the NetQ Agent.

   ```
   root@rhel7:~# netq config restart agent
   ```

7. Optionally, configure the RHEL/CentOS server to run the NetQ CLI.

   ```
   root@rhel7:~# netq config add cli server <netq-platform-ip-
   address>
   Updated cli server 192.168.1.254 vrf default. Please restart
   netqd (netq config restart cli).
   ```

8. Restart the CLI.

   ```
   root@rhel7:~# netq config restart cli
   ```

9. Repeat these steps for each switch/host running Ubuntu, or use an automation tool to install NetQ Agent on multiple switches/hosts.

Configure Optional NetQ Agent Settings

Once the NetQ Agents have been installed on the network nodes you want to monitor, the NetQ Agents must be configured to obtain useful and relevant data. The code examples shown in this section illustrate how to configure the NetQ Agent on a Cumulus switch, but it is exactly the same for the other type of nodes. If you have already configured these settings, you do not need to do so again.

- Configuring the Agent to Use a VRF
- Configuring the Agent to Communicate over a Specific Port

Configure the Agent to Use a VRF Interface

While optional, Cumulus strongly recommends that you configure NetQ Agents to communicate with the NetQ Platform only via a VRF, including a management VRF. To do so, you need to specify the VRF name when configuring the NetQ Agent. For example, if the management VRF is configured and you want the agent to communicate with the NetQ Platform over it, configure the agent like this:

```
cumulus@leaf01:~$ netq config add agent server 192.168.1.254 vrf mgmt
cumulus@leaf01:~$ netq config add cli server 192.168.254 vrf mgmt
```

You then restart the agent:

```
cumulus@leaf01:~$ netq config restart agent
cumulus@leaf01:~$ netq config restart cli
```

Configure the Agent to Communicate over a Specific Port

By default, NetQ uses port 8981 for communication between the NetQ Platform and NetQ Agents. If you want the NetQ Agent to communicate with the NetQ Platform via a different port, you need to specify the port number when configuring the NetQ Agent like this:

```
cumulus@switch:~$ netq config add agent server 192.168.1.254 port 7379
```

You then restart the agent:

```
cumulus@leaf01:~$ netq config restart agent
```