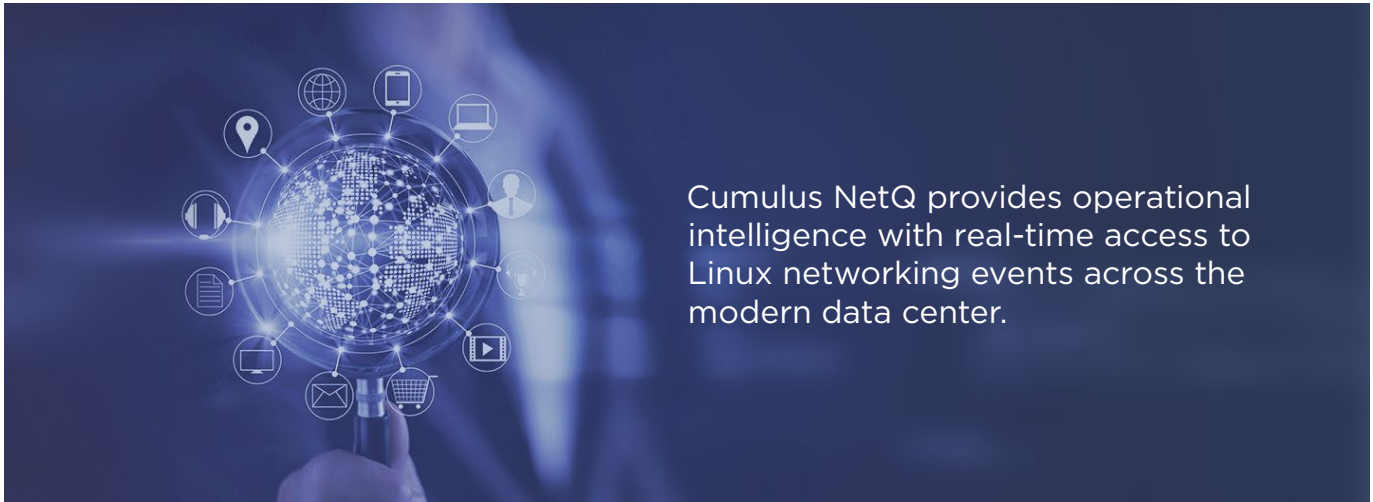


Cumulus NetQ

ACHIEVE END-TO-END ACTIONABLE INSIGHT FROM THE HOST TO THE SWITCH



Cumulus NetQ provides operational intelligence with real-time access to Linux networking events across the modern data center.

Now more than ever before, the network must deliver richer application experiences to customers and connect a rapidly increasing numbers of users. These applications and services rely on an agile network to deliver compelling, brand building, revenue generating experiences.

Yet with the onset of microservices, containers, and virtual machines, changes to the network happen constantly. If there's ever a connection problem, the impact is significant. Trying to identify what went wrong in this virtual, ephemeral network is like trying to find the proverbial needle in a haystack. And troubleshooting the network often requires manual, box-by-box intervention.

Designed to help operationalize Cumulus Linux, Cumulus NetQ provides actionable insight into every trace and hop in the Linux-based data center — from the container, virtual machine, or host, all the way to the switch and port. The metadata it collects across these elements arms network operations teams with visibility into and intelligence about the health of the network, to make sure everything is behaving as intended. As an agent-based telemetry technology, NetQ is designed to run on any Linux operating system or application across the data center — like Ubuntu and RedHat.

NetQ is unique in this capability since it is the only telemetry agent in the market that is integrated with container orchestrators, as well as the Netlink interface into the Linux Kernel, thereby providing real-time access to Linux networking events across the Linux-based data center. NetQ upgrades network operations from a manual, reactive, box-by-box approach to one that is an automated, informed and agile.



BENEFITS

- Reduce downtime
- Save on operational costs
- Operate containers with confidence
- Increase agility
- Obtain host to switch visibility
- Remediate faster
- Simplify operations

An Operations Tool for Host-to-Switch Actionable Insight

NetQ continuously checks for various network events and sends real-time alerts to notify users that a network event occurred. When alerted, you can query the entire network to determine precisely where the fault occurred and remediate quickly. Every event — i.e. new device, routes, IP addresses, BGP flap, etc.— gets time-stamped so you can go back in time and know the state of the network wherever in the fabric that issue occurred.

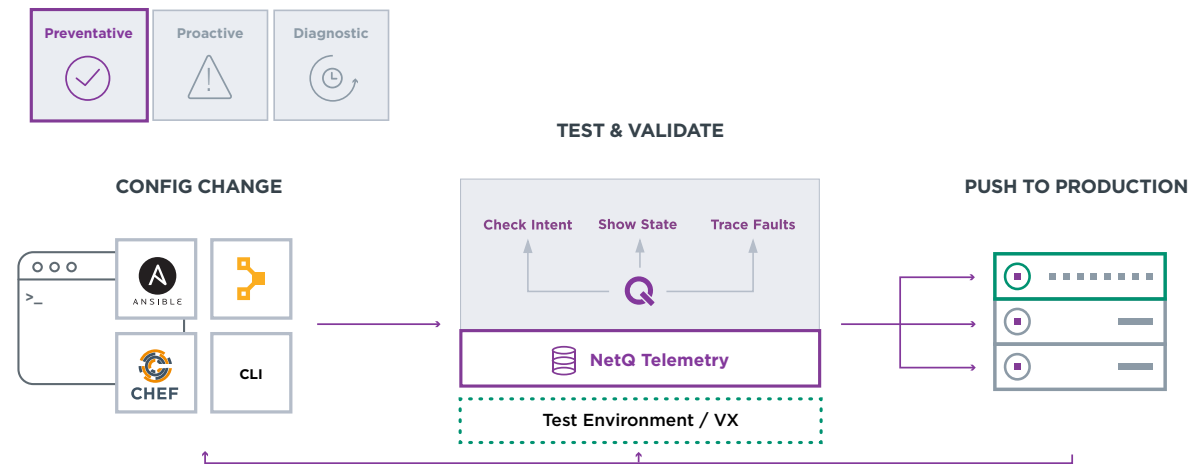
Furthermore, you can troubleshoot from wherever you have an internet connection and get remote access into all of fabric throughout the data center. Gone are the days of running to the data center, logging into the individual network devices, and doing box-by-box troubleshooting.

Cumulus NetQ also enables DevOps collaboration. Having an operational tool that gives host-to-switch actionable insight means better NetDevOps collaboration across various teams. First and foremost, network operators will be able to avoid mistakes, resolve issues faster, analyze with complete visibility how issues were created, elevate issues seamlessly, and get alerted proactively. Second,

cloud administrators will get a unified view of the entire data center network. And third, the system administrators will be able to integrate NetQ with existing CI/CD tools to be able to see comprehensive network information without actually touching the network. Additionally, any person in the team can be alerted of issues via Slack, PagerDuty or Elastic to quickly point out which switch is up or down, and how to fix it.

This is Actionable Insight. Without this deep visibility, you can't operate your network intelligently. With Cumulus NetQ, you obtain holistic, collaborative, actionable insight into every change or issue in the modern data center. Your network doesn't stop at your top of rack switch; your visibility or troubleshooting boundary shouldn't either.

NetQ is built for the modern, automated cloud network and gives network operators the comfort to identify, embrace, and manage the risk of the ever changing data center fabric. To do this, NetQ uses a three-pronged approach to ensure the network is operating as intended... 1) Preventative Validation, 2) Proactive Alerting, and 3) Diagnostic Troubleshooting.



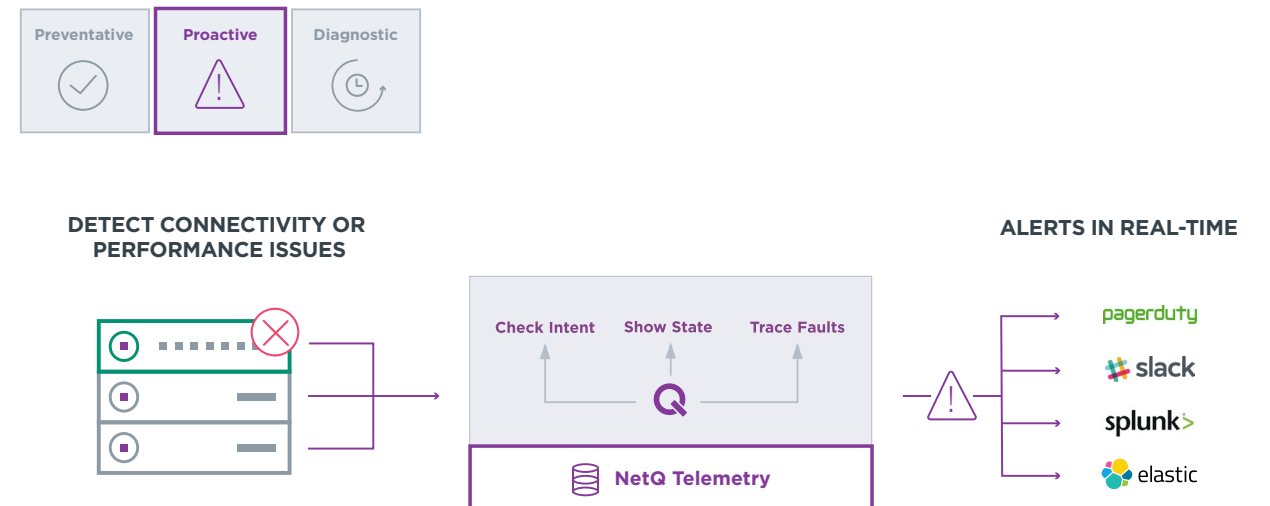
PREVENTATIVE VALIDATION

Sadly, we still see major application outages because of brittle, burdened networks. Without NetQ, network troubleshooting often requires manual, box-by-box intervention. The statistics around network downtime are staggering:

- **Network outages occur 5 times each month - Network Computing**
- **80% of time wasted on manual network operations - ONUG**
- **Businesses lose an estimated \$4 million a year to network downtime - Infonetics**

NetQ enables you to validate network behavior and network health. Prior to deployment, NetQ can be used in a virtual environment to ensure the network will work as intended. Additionally, it can be used during an upgrade window to reduce validation time and effort. NetQ validates network behavior by using check, show and trace algorithms, which significantly reduces manual errors, one of the main causes of network downtime.

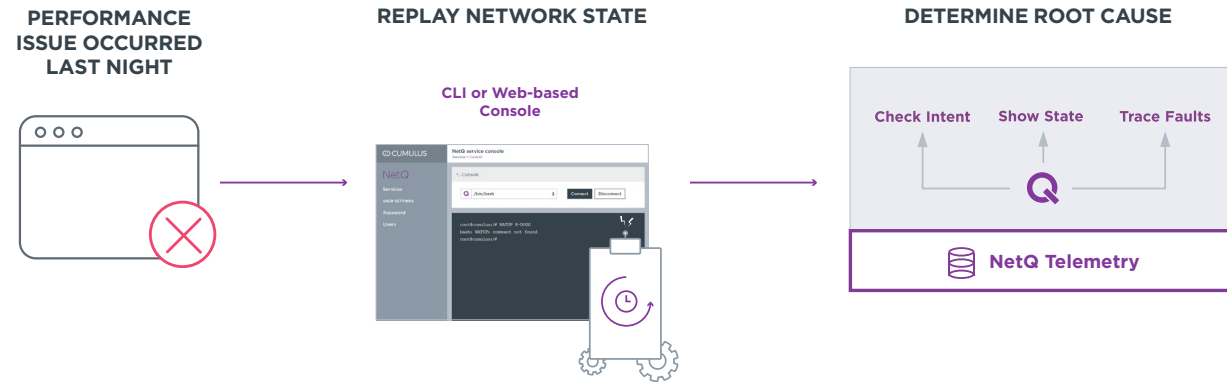
This network validation becomes a simplified, automated process since NetQ queries the entire fabric with a single command. Additionally, NetQ commands can be integrated within Ansible playbooks, enabling multiple check and show commands to be performed without user entry, making this validation exercise a seamless process.



PROACTIVE ALERTING

Connectivity or performance issues are a symptom of faulty network behaviour that can result in downtime. In addition to validating configuration changes when rolling out, NetQ continually and algorithmically checks for these symptoms and sends real-time alerts to notify users that a network state deviation has occurred. When alerted, you'll know precisely where the fault occurred so you can remediate

quickly. Plus, event notifications can be received via Slack, PagerDuty, Splunk, Elastic and other 3rd party tools so that any part of the IT team can all be alerted and start troubleshooting. That means if an Interface goes down or BGP peer goes down, NetQ will send alerts. And filters can be established so certain people get certain notifications across specific channels.



DIAGNOSTIC TROUBLESHOOTING

Just like if you had a time machine, NetQ allows you to go back in time to replay network state, see fabric-wide event changelog and find root cause state deviations. NetQ not only allows you to replay network wide events, but also allows for the ability to trace network paths. This state-of-the-art functionality allows you to determine whether or not the network was at fault and, if it is a network issue, find the

exact cause so you can fix the problem and avoid it in the future. Of course, NetQ allows you to be more than reactive. You can proactively check the state of the network and run end-to-end trace routes at any time. Perhaps the best part of this, you can do this troubleshooting at anytime, from any node, and from any place.

Technical specification

NetQ is designed to work seamlessly across the modern, web-scale data center running Linux. Here's a look at the details...

COMPONENTS		
Includes		Description
Agents	Switch agents	Network Telemetry Agents feeding fabric data to Telemetry Server, installable on Cumulus Linux.
	Host agents*	Host Telemetry Agents feeding host network data to Telemetry Server.* Installable on Ubuntu, CentOS, RHEL hosts query info from Telemetry Server from any node or host without logging into the network.

Telemetry Server	Analytics	Validate Fabric-Wide status with a single command via the NetQ CLI.
	Notifier	Get real-time notifications for fabric-wide changes. Notifier allows rules to redirect notification messages based on severity, device, service. Eg. send all warning messages and higher to PagerDuty, Slack, Splunk, Elk, Elastic for better alerting.
	Database	Redis (for high-performance in-memory) and InfluxDB** (for interface statistics) that is used for historic data storage

* Requires [Host Pack](#) purchase

** EA feature in NetQ 1.3

CHARACTERISTICS			
		NetQ	Description
Data	<i>Type</i>	Telemetry	Gathers data from host* and switch agents
	<i>Frequency</i>	Real-time Granularity	Get alerted in real time of network issues or connectivity loss
	<i>Access</i>	Single console	Access all of your data from one screen without logging into the network. Delegate access to other teams to streamline network analysis.
Analysis	<i>Tools</i>	Check, Show, Trace	Get all the information you need with three easy commands that you can automate
	<i>Correlation</i>	Algorithmic	NetQ will check for errors and verify topology for you.
	<i>Human Interaction</i>	Preventive, Proactive, Diagnostic	Operators can use NetQ to validate configuration changes, get alerted of issues in real time and analyze issues after they occur.
Teams		Network + Cloud, Devops	Bring your entire cloud team together by allowing them to validate network without perturbing the actual network config
Deployment		In-Band	Baked into the network
		Cumulus Linux 3.3	NetQ requires minimum version Cumulus Linux 3.3 to operate

* Host visibility requires [Host Pack](#) purchase.

System requirements

NETQ TELEMETRY SERVER REQUIREMENTS:		
	Production Deployment	Lab Usage or Pre-Production Validation
Hypervisor	VMware ESX 6.5 Red-Hat 7 Ubuntu 16.04	VMware Workstation, Fusion or ESXi VirtualBox Vagrant box
Minimum Requirements	CPU: Quad core RAM: 16G Storage: 256G	CPU: Quad core RAM: 16G Storage: 256G

NETQ AGENT REQUIREMENTS		
	Production Deployment	Lab Usage or Pre-Production Validation
Cumulus Linux Software Version	Minimum CL Version: 3.3	Minimum VX Version: 3.3
Host Visibility*	Ubuntu 16.04, RHEL7, CentOS7	Ubuntu 16.04, RHEL7, CentOS7

* Requires [Host Pack](#) purchase

FEATURES		
	Intractable fabric-wide questions	NetQ's algorithmic solution
Host*	Where is this container located? Open Ports? What image is being used? Which containers are part of this service? How are they connected? ToR Impact on Service?	show Docker container show Docker container service show Kubernetes deployment trace container connectivity
Overlay	Is my overlay configured correctly? Is my control-plane configured correctly? Can A reach B over an overlay/ underlay path?	check/show vxlan, check evpn/Inv

L3	Is BGP working as expected? Is there a STP loop? Can IP A reach IP B?	check/show BGP show stp trace I3
L2	Is CLAG configured correctly? Is there a STP loop? Is there a MTU mismatch? How does Mac A reach B?	check/show CLAG show stp check/show vlan check mtu trace L2
OS	Are all switches licensed correctly? Do all switches have NetQ agents running?	check/show cl-license check/show agents
Interfaces	Is my link down? Are all bond links up? What optics am I using? What's the peer for this port? Which ports are empty? Is there a link mismatch? Any links flapping?	show interfaces check interfaces show Mac
Hardware	Have any components crashed? What switches do I have in the network?	check/show sensors show Inventory

* Requires [Host Pack](#) purchase

For more information on NetQ, and how you can try NetQ, please the following resources:

Please visit our [technical documentation](#).

NetQ Demo GitHub sites

- Use NetQ to verify Docker settings - <https://github.com/CumulusNetworks/cldemo-netq>
- Use NetQ to implement “Chaos Tamarin” to ID and FIX network issue - <https://github.com/plumbis/nfd17>
- Video of this demo - <https://vimeo.com/253197258>

How to try NetQ

- [Cumulus in the Cloud](#) is a virtual data center that includes the NetQ telemetry server for monitoring your Cumulus in the Cloud instance.
- [Try NetQ in your own Vagrant/virtual environment - https://cumulusnetworks.com/downloads/#product=NetQ](https://cumulusnetworks.com/downloads/#product=NetQ) Virtual

How to request a trial NetQ license

- Organizations can also reach out to your [dedicated sales representative](#)

ABOUT CUMULUS NETWORKS*

Cumulus Networks is leading the transformation of bringing web-scale networking to enterprise cloud. Its network switch, Cumulus Linux, is the only solution that allows you to affordably build and efficiently operate your network like the world’s largest data center operators, unlocking vertical network stacks. By allowing operators to use standard hardware components, Cumulus Linux offers unprecedented operational speed and agility, at the industry’s most competitive cost. Cumulus Networks has received venture funding from Andreessen Horowitz, Battery Ventures, Capital, Peter Wagner and four of the original VMware founders.

For more information visit cumulusnetworks.com or follow [@cumulusnetworks](https://twitter.com/cumulusnetworks).