Introducing the Lenovo Network Advisor for Splunk Telemetry Application

Introduces Lenovo telemetry integration with Splunk

Describes the various dashboards offered by Lenovo Network Advisor

Provides an overview of the Lenovo dataset

Describes Lenovo switch capabilities for continuous network data gathering

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Abstract

Lenovo® Network Advisor for Splunk is a telemetry application developed by Lenovo within the Splunk ecosystem, which allows Splunk Enterprise to monitor telemetry data from Lenovo network switches running Lenovo Cloud Network Operating System (CNOS).

Lenovo Network Advisor uses REST APIs to collect telemetry data including switch-related system health, interface and traffic statistics, congestion statistics and buffer utilization. The telemetry dataset enables the application to provide insights into the network utilization status, and notifications about current or potential network problems, which would otherwise be unnoticed such as microbursts.

This paper details the capabilities, installation, and configuration of Lenovo Network Advisor for Splunk. The paper will allow network architects, analysts, and others to understand the capabilities of Lenovo Network Advisor for Splunk in terms of visualization, analysis, and search, as a way to achieve seamless network operations and troubleshooting.

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Introduction

Data centers have grown phenomenally in recent times with the increased adoption of cloud software, software defined networks, hyperscale and big data. With the growth of cloud networks, traditional static networks are moving towards dynamic virtualized networks. New tools are required to troubleshoot, monitor, and provide application and infrastructure visibility of these networks.

Lenovo Network Advisor is a software application that reduces operational costs by providing key network insights, including:

- Visibility of network utilization, which allows IT administrators to plan their network and redistribute traffic loads to optimally leverage underutilized infrastructure.
- Identification of workloads, which allows identification of workloads per application groups and communication patterns.
- Proactive detection of problems, which identifies congestion and detects hot spots before they adversely affect network operations through trend monitoring, or after the fact using microburst detection.

Figure 1 shows the telemetry ecosystem with switches and tools, and examples of the types of conditions that can be detected. The figure depicts the various components of the telemetry ecosystem and explains the steps involved in collecting different type of data.

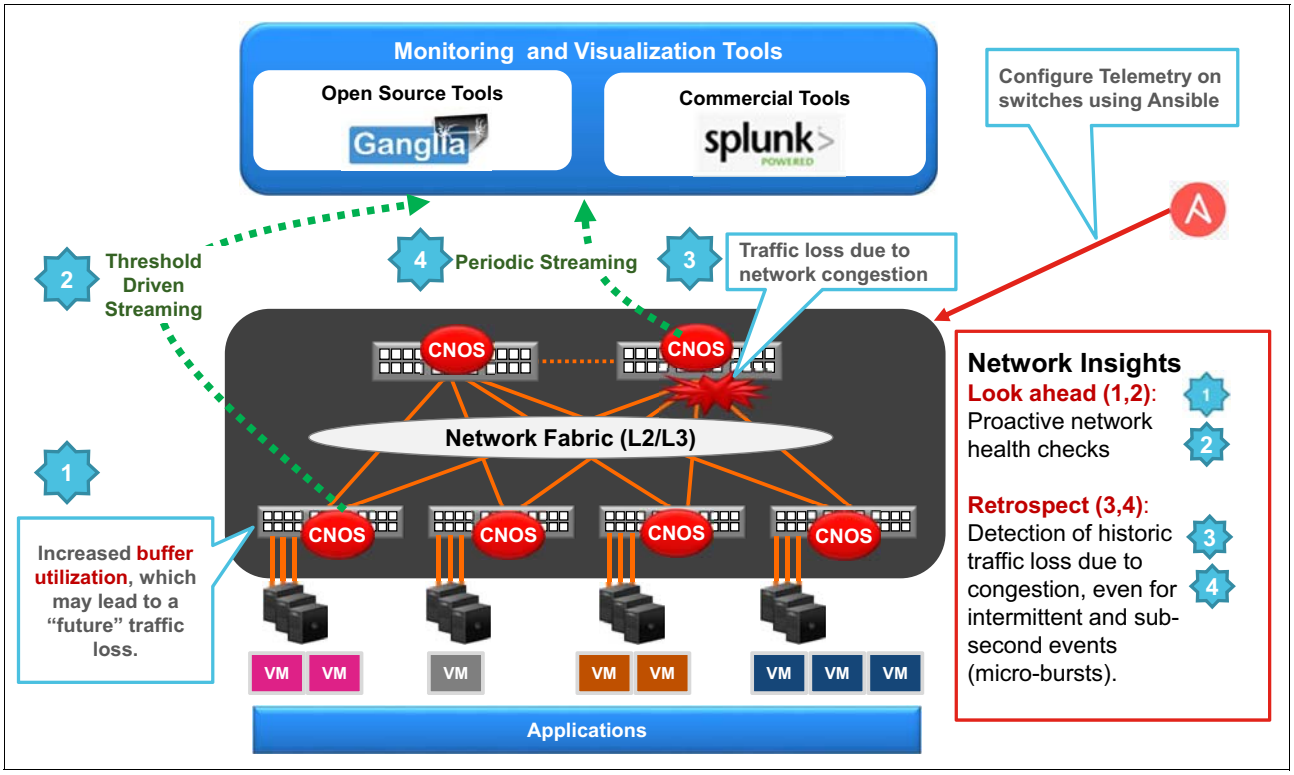

Figure 1 Telemetry Ecosystem – Switches, tools, and sample detection capabilities

Application overview

Lenovo Network Advisor for Splunk application provides insights into network utilization, which allows for quick troubleshooting of switches contributing to inefficient network usage. This translates into the effective usage of compute and network resources.

The datasets supported by Lenovo Network Advisor for Splunk include:

- Basic Dataset
  - Network and Device Health Status: temperature, fans, power, memory, CPU
  - Traffic Statistics and Performance: interface counters
  - Critical Network and Device Alerts
- Advanced Dataset
  - In-Depth Buffer Utilization
  - Interface Congestion Statistics

Lenovo Network Advisor for Splunk follows an off-box forwarder model. In the off-box forwarder model, instances of the Splunk universal forwarder run on a dedicated physical or virtual machine and retrieves data from Lenovo CNOS switches through REST APIs. Each forwarder is mapped one to one with a CNOS switch.

Figure 2 shows Lenovo Network Advisor interacting with various components to visualize the network data.

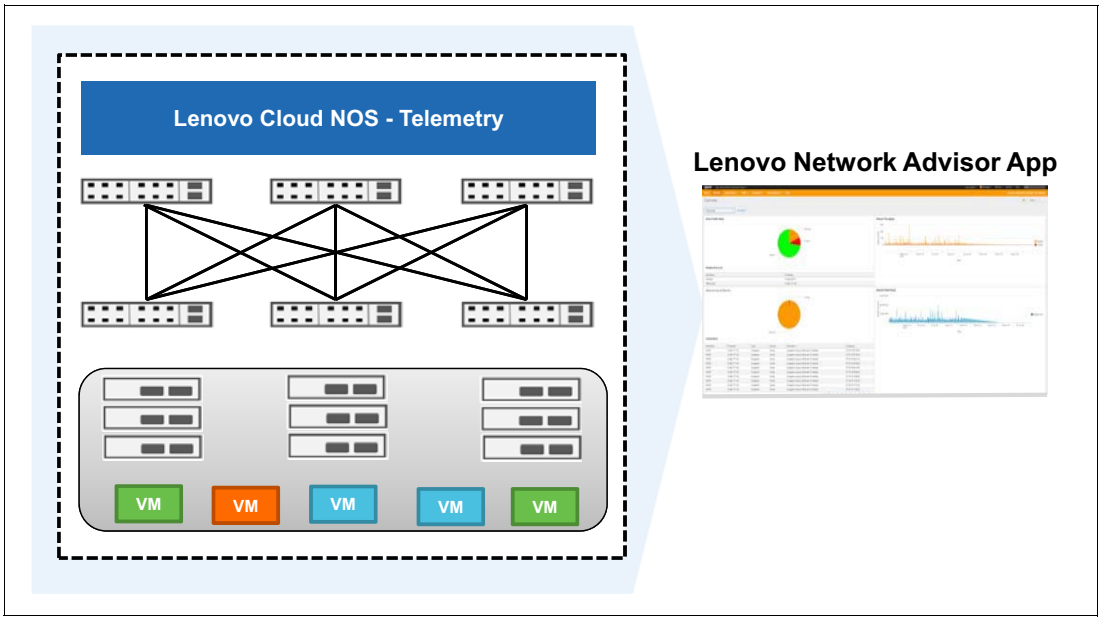

Figure 2 Lenovo Network Advisor App

The Overview dashboard, shown in Figure 3, displays a summary of health, traffic, congestion and network buffer utilization of the switches in the data center.

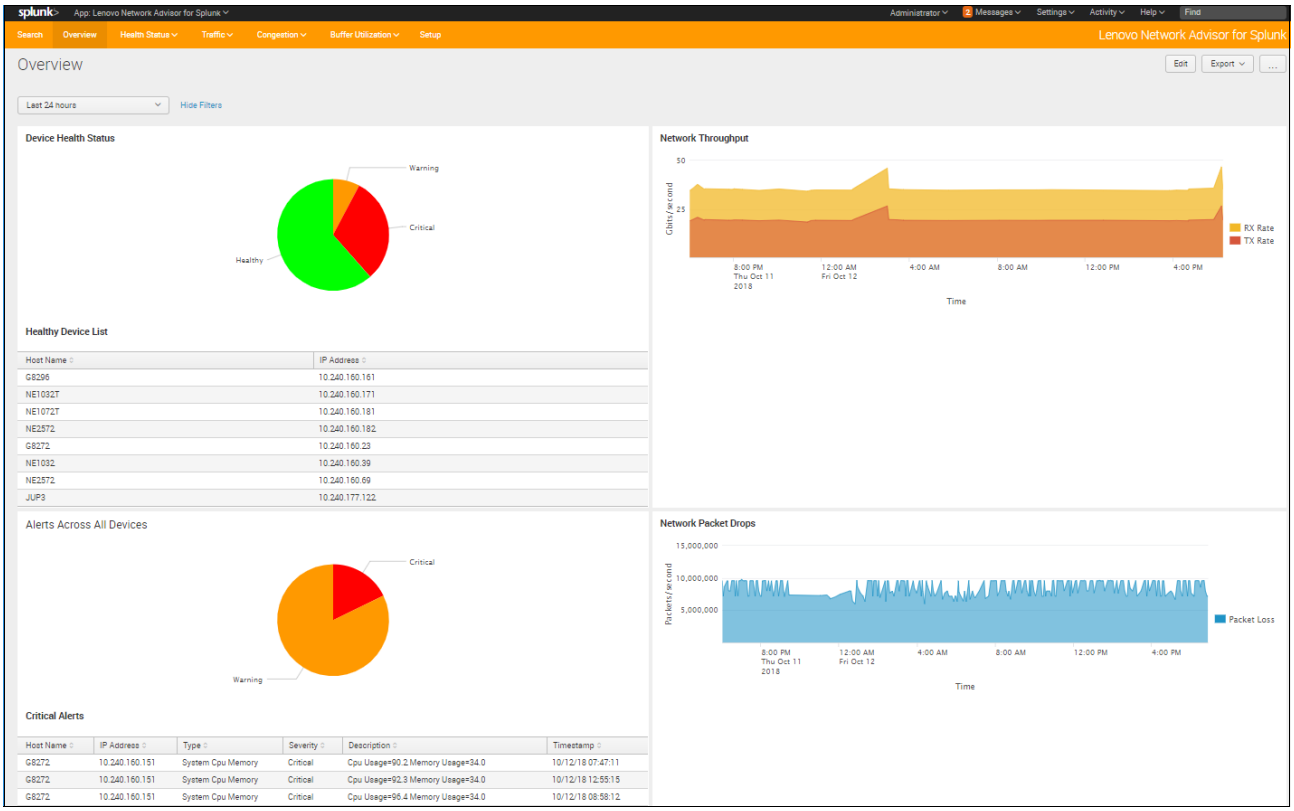

Figure 3 Overview Dashboard

The top-left panel classifies switch states as Healthy, Warning and Critical based on the analysis of the telemetry data.

- Switches in Critical state have severe operational problems and require immediate attention.
- Switches in Warning state have one or more operational alerts, which may become severe problems in the near future.
- Switches in Healthy state have no reported alarms and are operating without any problems.

The bottom-left panel displays alerts, which are events that require administrator attention. The top-right panel and bottom-right panels show the aggregated traffic throughput and packet loss across all the switches.

Health Status menu

Under the **Health Status** menu item, the different switch health parameters like the Temperature, Fans, Power, CPU and Memory utilization dashboards can be accessed.

The Temperature dashboard, Figure 4 on page 6, shows spark line graphs of the switch's CPU, ambient, and hot-spot temperature sensors. Since not all switch models support all types of sensors, the dashboard clearly identifies unsupported sensors with the text “NA”.

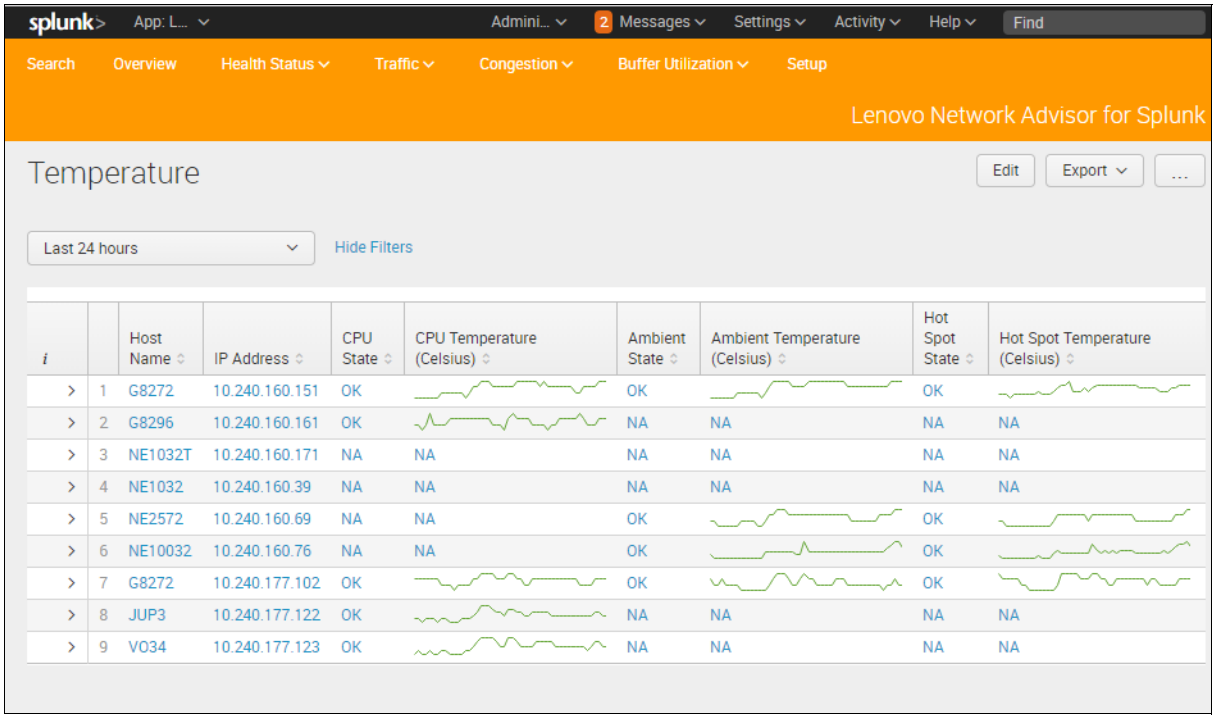

Figure 4 Temperature dashboard

The Power dashboard, Figure 5, provides switch's power supply status information.

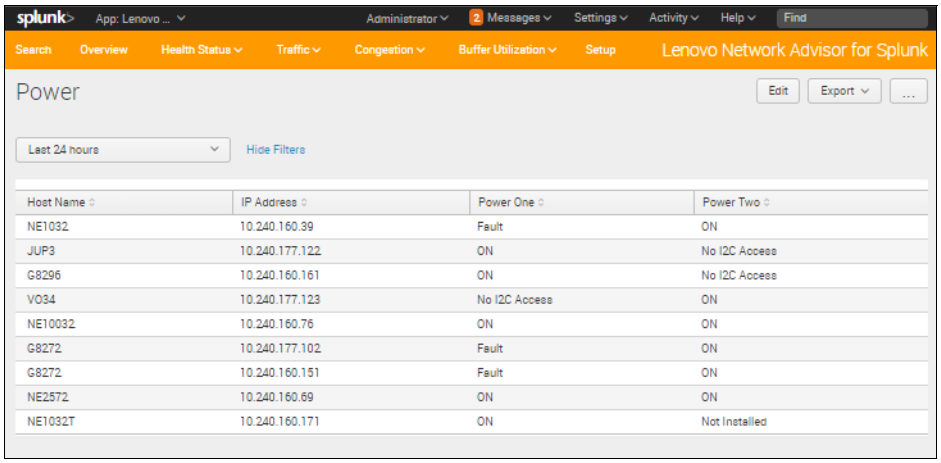

Figure 5 Power dashboard

The Fans dashboard, Figure 6 on page 7, provides detailed information of the switch's average fan speed of all running fans, number of active fans, number of inactive fans, and total number of fans.

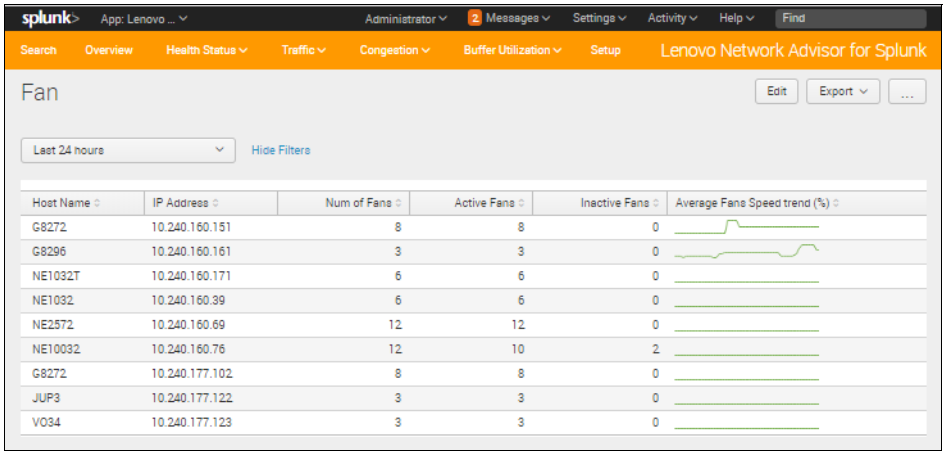

Figure 6 Fans dashboard

The CPU and Memory dashboard, Figure 7, provides the switch's CPU and Memory utilization information.. The dashboard shows spark line graphs of CPU and memory over time.

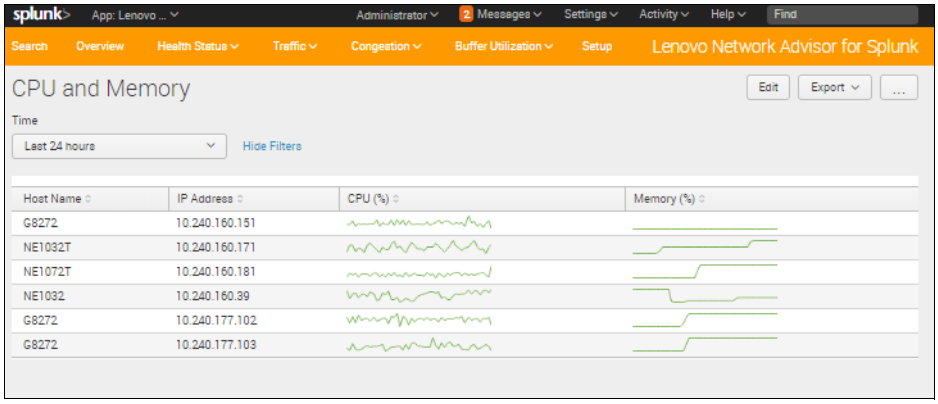

Figure 7 CPU and Memory dashboard

The Device Statistics dashboard, Figure 8 on page 8, displays the spark line graph of aggregate interface rates of each network switch. This dashboard allows the selection of the following types of statistics:

- Basic: Input and Output Counters
- Errors Discards: Errors and Discards Counters
- Unicast: Unicast Counters
- Multicast: Multicast Counters
- All: All Statistic Counters

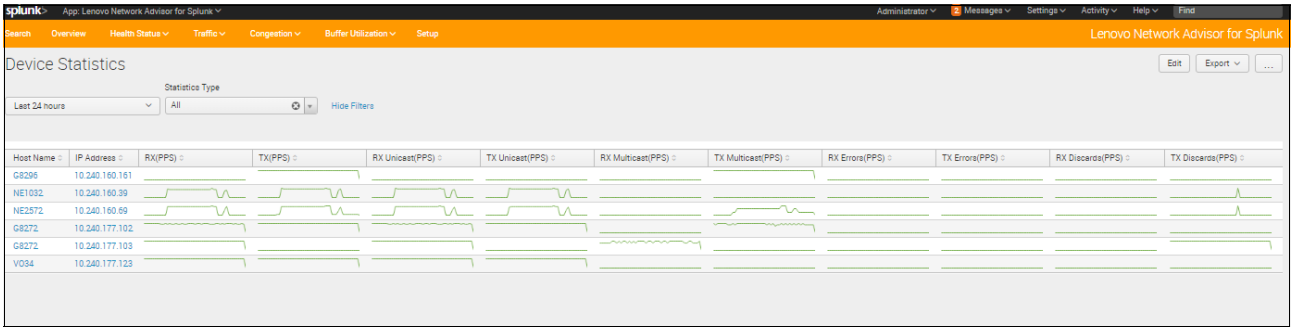

Figure 8 Device Statistics dashboard

The Device Interface Statistics dashboard, Figure 9, displays the interface level statistics of a network switch. The user has an option to select the switch by either Host Name or IP Address. The example screenshot below presents the device interface statistics for switch 10.240.177.102.

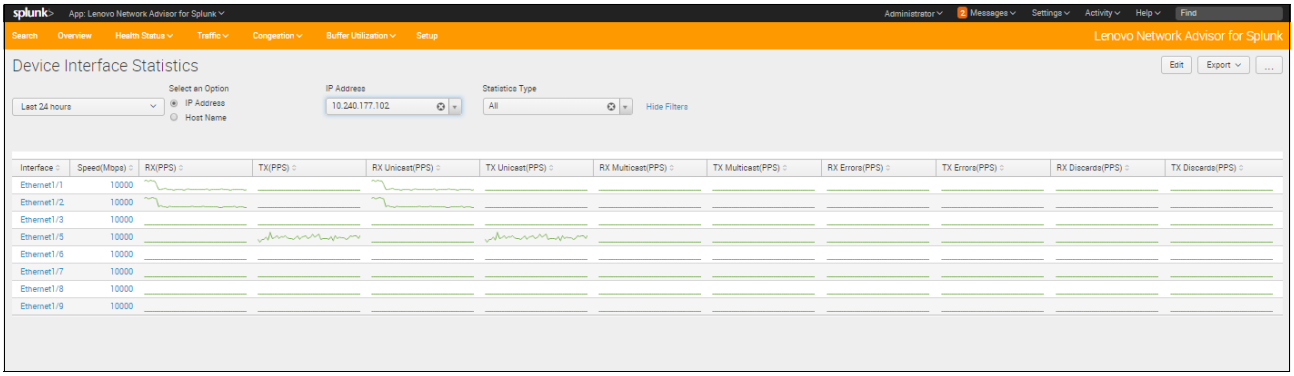

Figure 9 Device Interface Statistics dashboard

The Interface Statistics dashboard, Figure 10 on page 9, displays packet-size distribution chart of the incoming and outgoing packets on a particular interface.

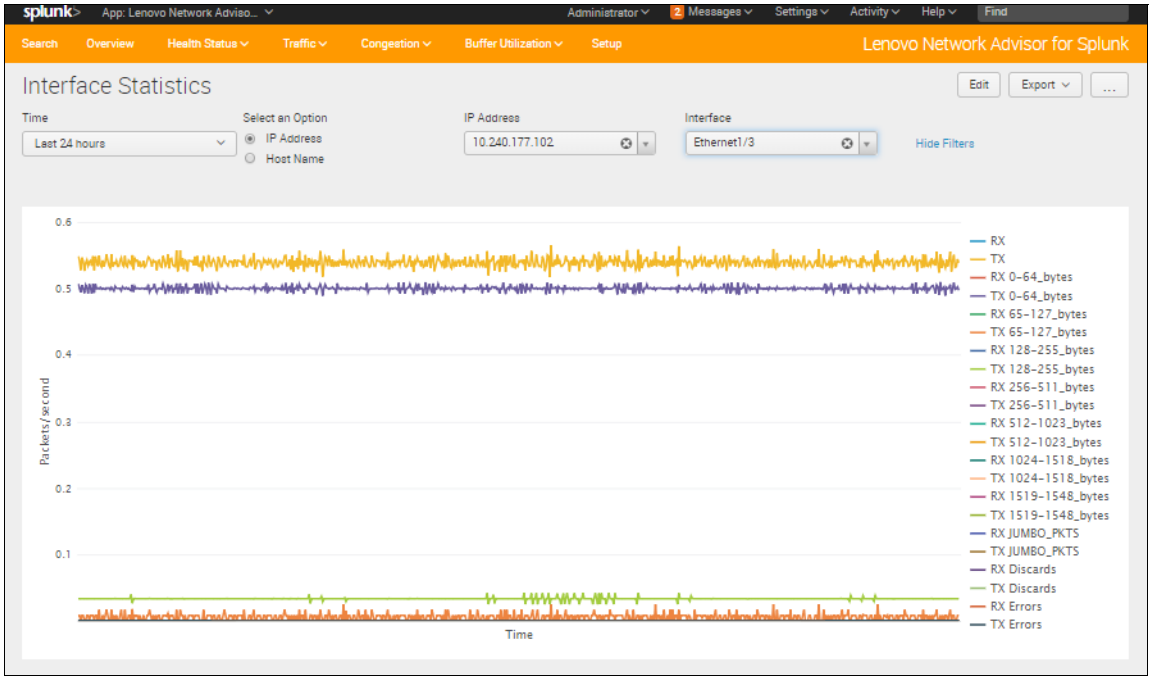

Figure 10 Interface Statistics dashboard

Device Congestion dashboards provide insights on network congestion at switch, interface, traffic type(unicast, multicast) with categorization based on class of service. This information is used to migrate workloads for better performance.

The Device Congestion dashboard, Figure 11, lists the devices experiencing congestion along with spark line graphs of aggregated congestion rates for the interfaces on a switch.

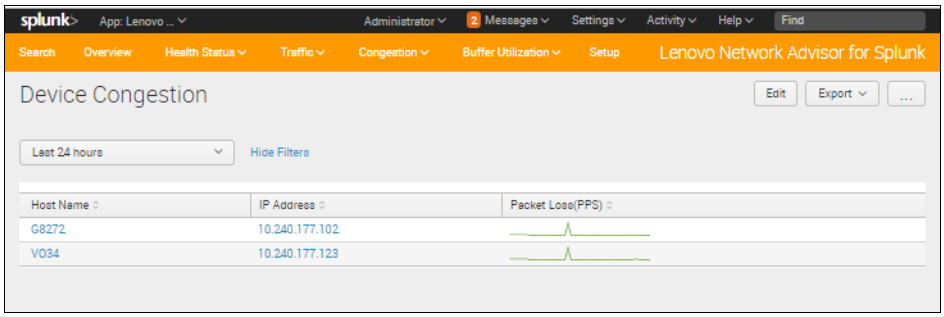

Figure 11 Device Congestion dashboard

The Device Interface Congestion dashboard, Figure 12 on page 10, lists the interfaces experiencing congestion on a particular switch.

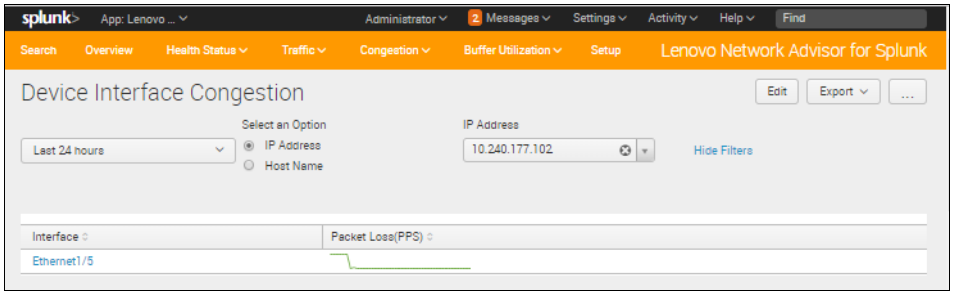

Figure 12 Device Interface Congestion dashboard

The Interface Congestion dashboard, Figure 13, depicts three different congestion charts on an interface controlled by the traffic type dropdown.

- All: This chart displays the distribution of unicast and multicast packet drops.
- Unicast: This chart displays the distribution of packet drops across unicast queue.
- Multicast: This chart displays the distribution of packet drops across multicast queue.

Figure 13 is an example representing interface Ethernet1/3 experiencing only unicast packet drops.

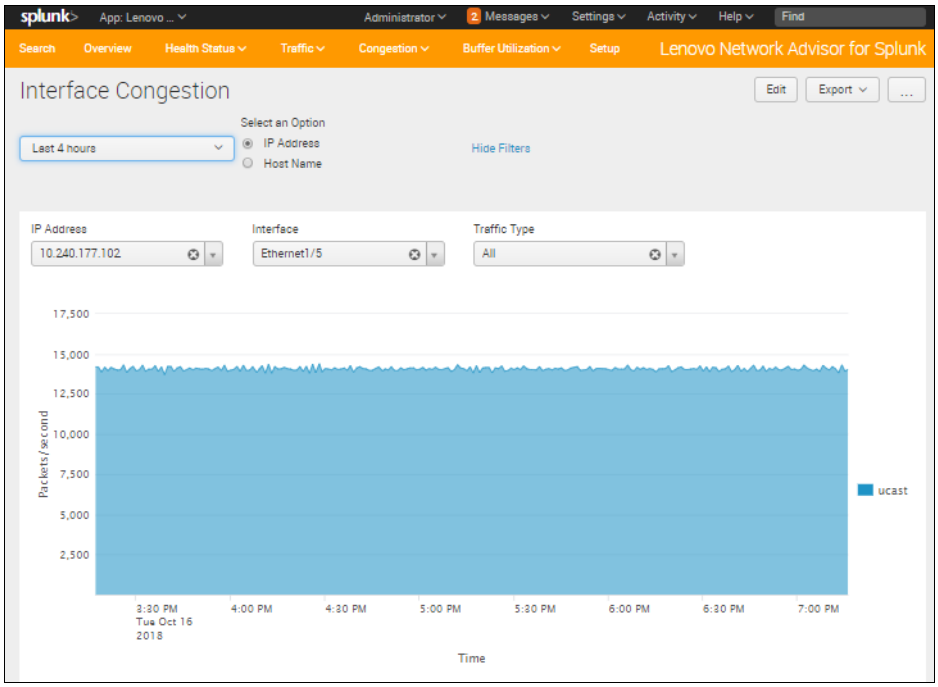

Figure 13 Interface Congestion dashboard – All Traffic Types

Figure 14 on page 11 shows the Unicast view.

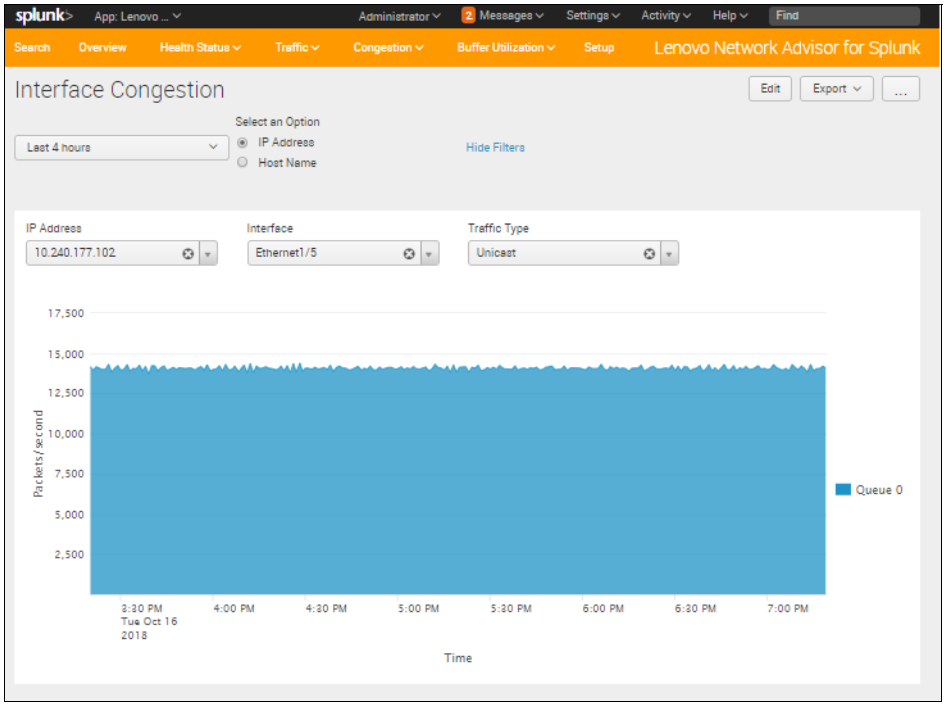

Figure 14 Interface Congestion dashboard – Unicast View

Buffer Utilization menu

Buffer Utilization dashboards provide information on bandwidth utilization based on long-term detailed trend analysis at various levels:

- Switch
- Interface (Ingress/Egress)
- Traffic Type (unicast/multicast)

This information helps customers to plan for long term expansion of physical infrastructure based on workload bandwidth utilization.

The **Buffer Utilization** menu supports a few dashboards, which provide insights on potential congestion on the switch before it happens. Lenovo CNOS switches use Broadcom Broadview Buffer Utilization APIs to fetch detail granularity of Buffer utilization. This menu consists of three dashboards:

- Device Buffer Utilization Summary
- Device Buffer Utilization Detail
- Device Interface Buffer Utilization

The Device Buffer Utilization Summary dashboard, Figure 15 on page 12, displays the buffer utilization summary of the network devices.

The different types of buffers whose utilization we account for are the following:

- Device Buffers
- Ingress Service Pool Buffers
- Ingress Port Service Pool Buffers
- Ingress Port Priority Group Buffers
- Service Pool Buffers
- Egress Port Service Pool Buffers

- Egress CPU Queue Buffers
- Egress RQE Queue Buffers

Figure 15 shows the Ingress Port Service Pool buffer category within the “Device Buffer Utilization Summary” dashboard.

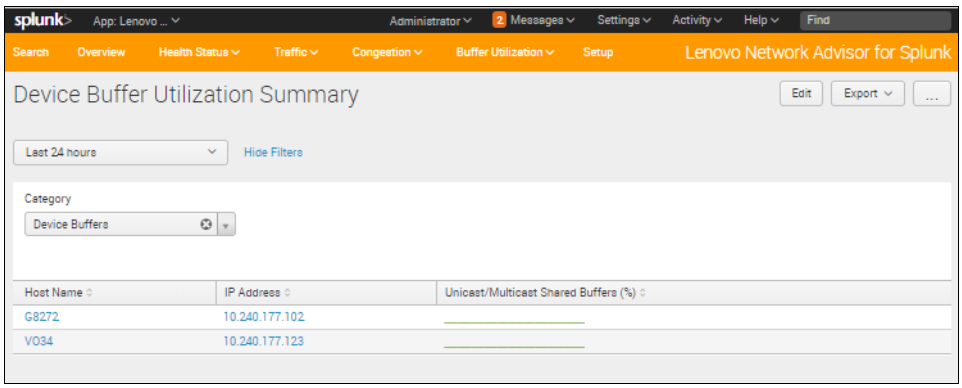

Figure 15 Device Buffer Utilization Summary dashboard

The Device Buffer Utilization Details dashboard, Figure 16, displays the cumulative utilization of buffers, which are associated with a switch as whole. In other words, it only includes buffers that are shared among all interfaces within a device.

Device level buffer utilization includes the following types of buffers:

- Device Buffers
- Ingress Service Pool Buffers
- Egress Service Pool Buffers
- Egress CPU Queue Buffers
- Egress RQE Queue Buffers

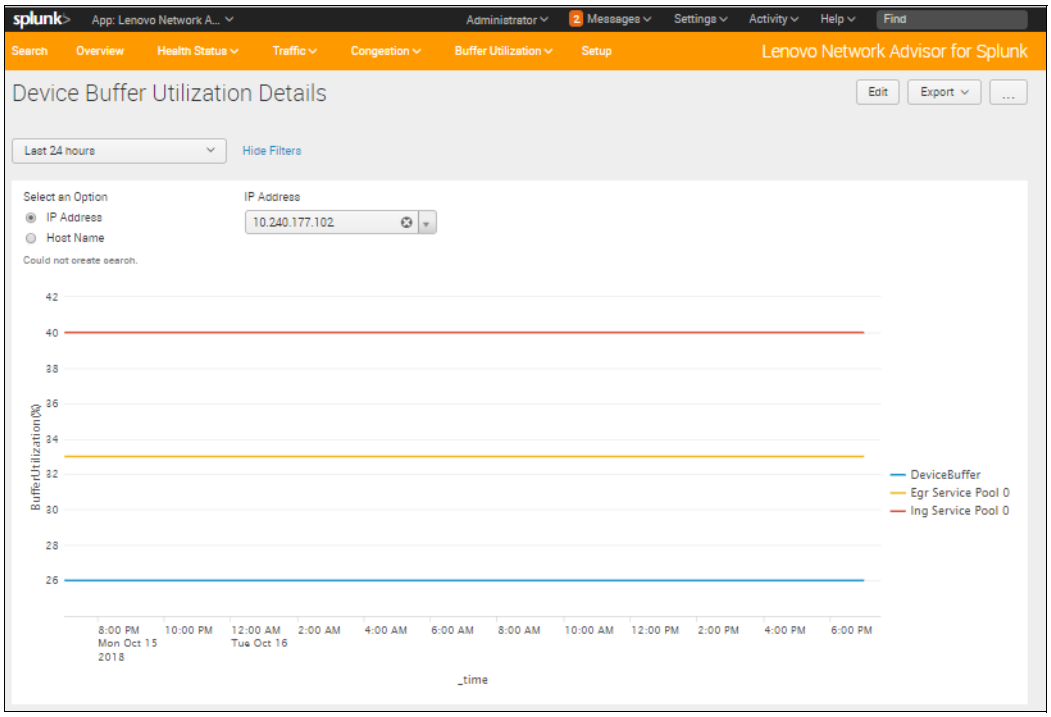

Figure 16 Device Buffer Utilization Details dashboard

The Device Interface Buffer Utilization Details dashboard, Figure 17, displays the cumulative chart of interface buffer utilization statistics of the selected switch. In other wprds, it only includes buffers that are used by specific interfaces and not shared among all interfaces within a device. The interface buffer utilization consists of Ingress Port Service Pool Buffers, Ingress Port Priority Group Buffers and Egress Port Service Pool Buffers category statistics.

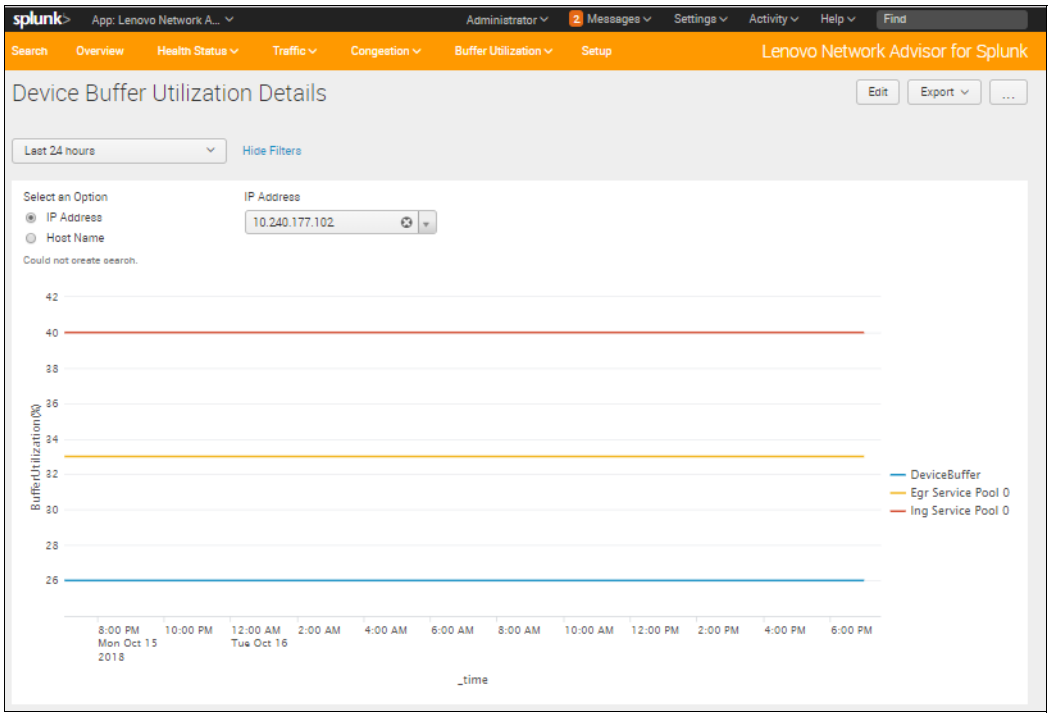

Figure 17 Device Interface Buffer Utilization Details dashboard

Installation

The Splunk Enterprise Server and a number of Universal Forwarders (depending on the number of switches present in the network) are required to be up and running before installing the Lenovo Network Advisor Application. This can be achieved either by using a Docker Container, or by manually installing Splunk.

Once the Splunk Enterprise Server and Forwarders are set up and configured correctly, the Lenovo Network Advisor Application should be installed.

For detailed installation instructions, review the Splunk Enterprise Server and Universal Forwarder Installation and Lenovo Network Advisor Installation sections of *Lenovo Network Advisor for Splunk Deployment and User Guide* located at:

http://systemx.lenovofiles.com/help/topic/com.lenovo.switchmgt.network_advisor_splunk.doc/network_advisor_splunk.html?cp=0_4_1_8

Summary

Lenovo Network Advisor for Splunk is a powerful tool for monitoring and troubleshooting complex networks comprised of Lenovo switches. The various dashboards provide powerful visual tools across multple network events to allow administrators to quickly detect network bottlenecks. Lenovo Network Advisor proactively mitigates network problems before they occur through advanced buffer utilization capabilities.

For more information about Lenovo Network Advisor, see the Lenovo Networking Information Center:

http://systemx.lenovofiles.com/help/topic/com.lenovo.switchmgt.network_advisor_splunk.doc/network_advisor_splunk.html?cp=0_4_1_8

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