Splunk for Network Engineers

Catalyst, Meraki, ISE, ThousandEyes and ITSI

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Session ID: BRKOPS-1233

Cisco Webex App

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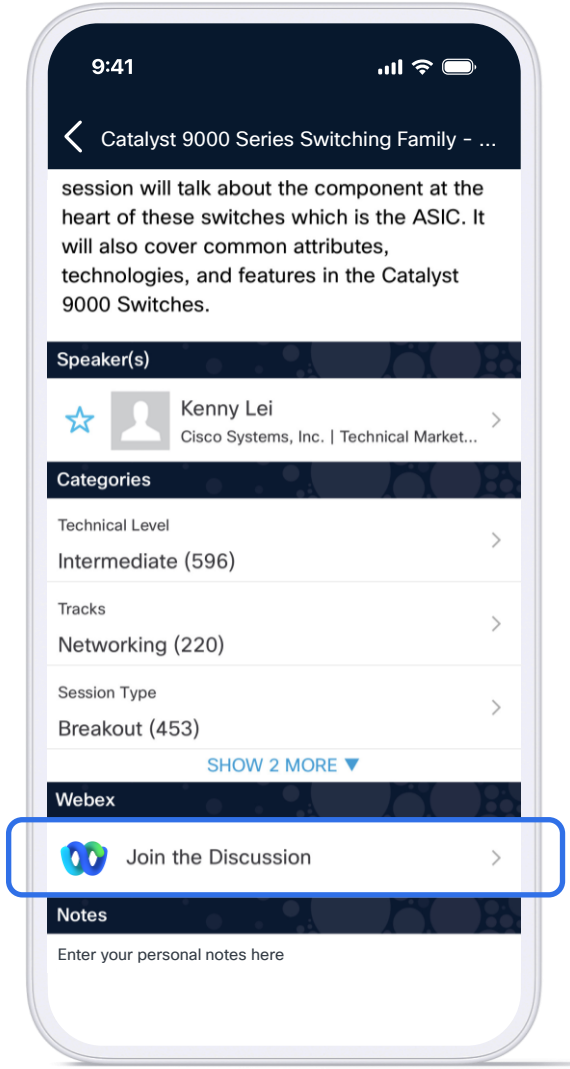


https://ciscolive.ciscoevents.com/
ciscolivebot/**#BRKOPS-1233**

Who am I?

- Over 20 years networking experience
- 6+ years in Cisco as Enterprise Networking Specialist

- Avid cyclist (used to be good)
- Keen (if not very good) skier

Agenda

01 Splunk Overview

02 Splunk Installation

03 Splunk Technology Add-Ons

04 Catalyst Add-On

05 Meraki App

06 ThousandEyes App

07 Splunk ITSI

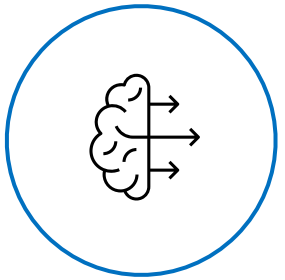
Session Assumptions

- Network Engineers/Operators
- Generally familiar with Catalyst Center, Identity Services Engine, SD-WAN and Meraki
- Less familiar with Thousand Eyes
- Even less familiar with Splunk
- Probably never heard of ITSI

Why Splunk?

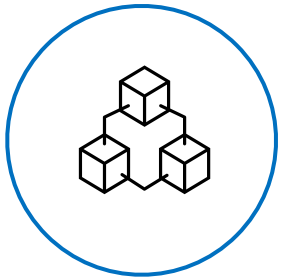
Consolidated Dashboard

- End-to-end view of network & security events
- Empower NetOps/SecOps when troubleshooting



Intelligence

- Interact with Cisco controllers for enhanced NetOps/SecOps experience
- Integrate with Splunk AI tools such as ITSI and MLTK



Splunkbase

- Ecosystem of applications to help you shape your data
- Install apps on Splunk Platform for parsing and indexing data

Full Stack Visibility

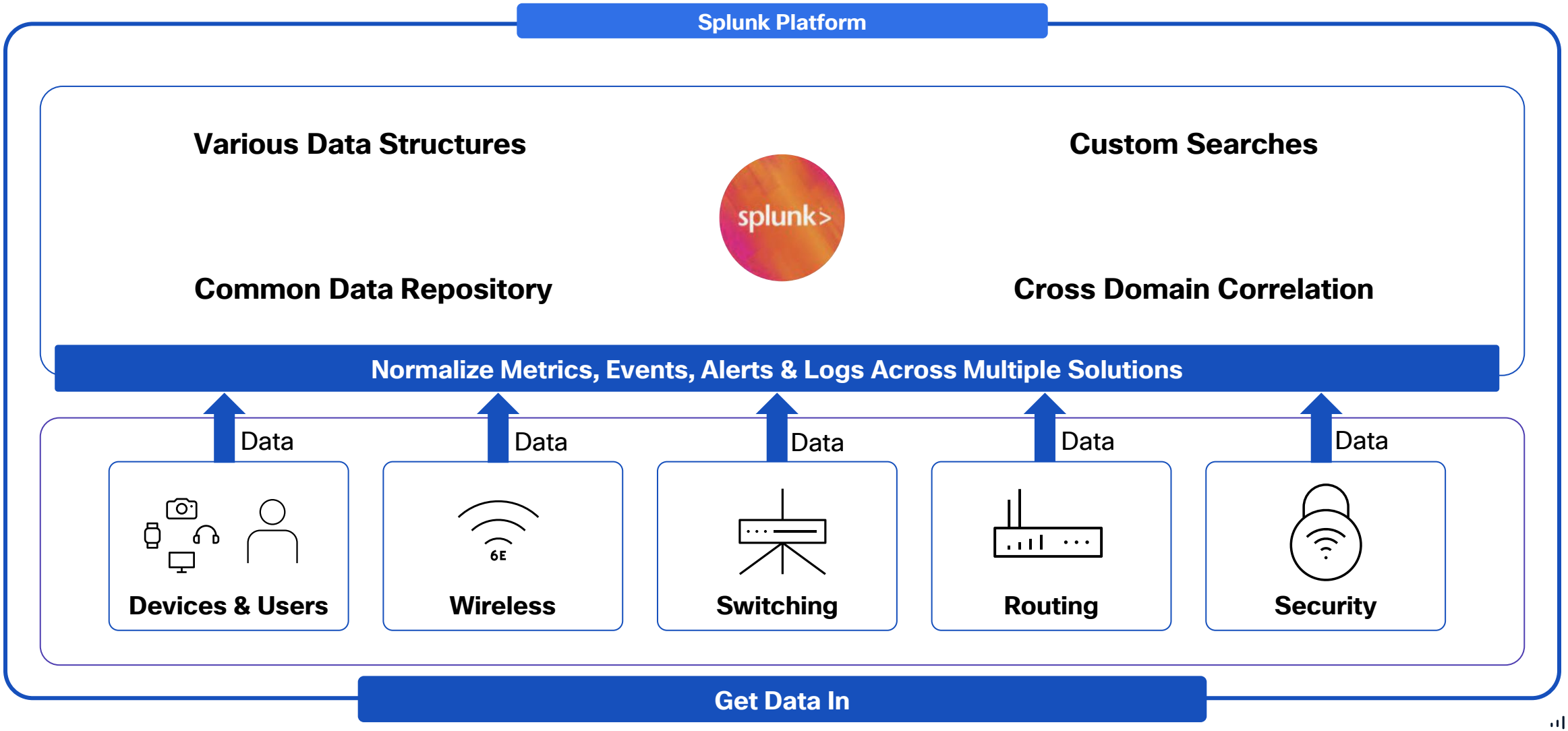
Faster RCA

Data Correlation

Artificial Intelligence

Getting Data to Splunk

Various Data Structures | Common Repository | Custom Searches



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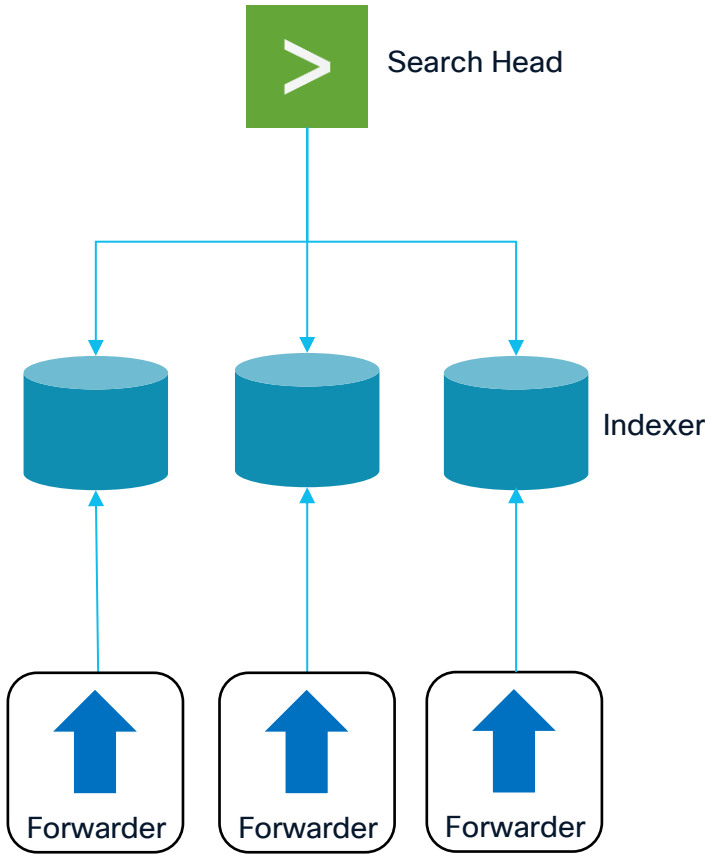
Splunk – Main Components



Search Head

- Handles search requests and consolidating results back to the user

Indexer

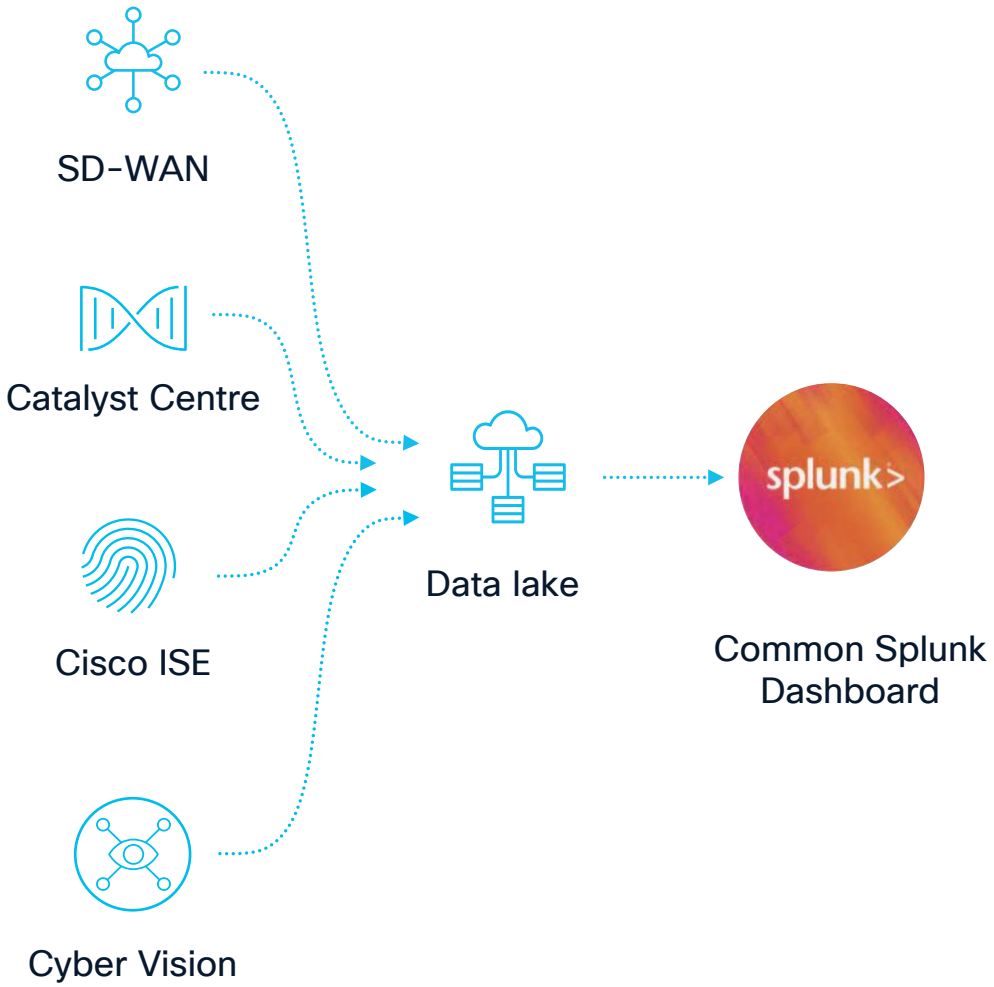
- Takes raw data from forwarders
- Converts the data into events and places the results into an index (bucket)

Forwarder

- Forwards raw data to indexer (or search head + indexer)
- 2 Types
  - **Universal Forwarder** – lightweight, streamlined data collection agent
  - **Heavy forwarder** – Full Splunk Enterprise instance with advanced data processing capabilities

Master Complexity with Observability

*Future Looking



Consolidated visibility (Shipping) on a common dashboard for real-time monitoring, history insights, security insights, and compliance advisory

Analytics dashboard* to detect and report on anomalies based on deviation from the baseline (potentially powered by ITSI)

Playbook driven response* based on certain event triggers to generate API calls back to the appropriate domain

Splunk ecosystem partner* trigger notifications to 1,000+ 3rd party applications

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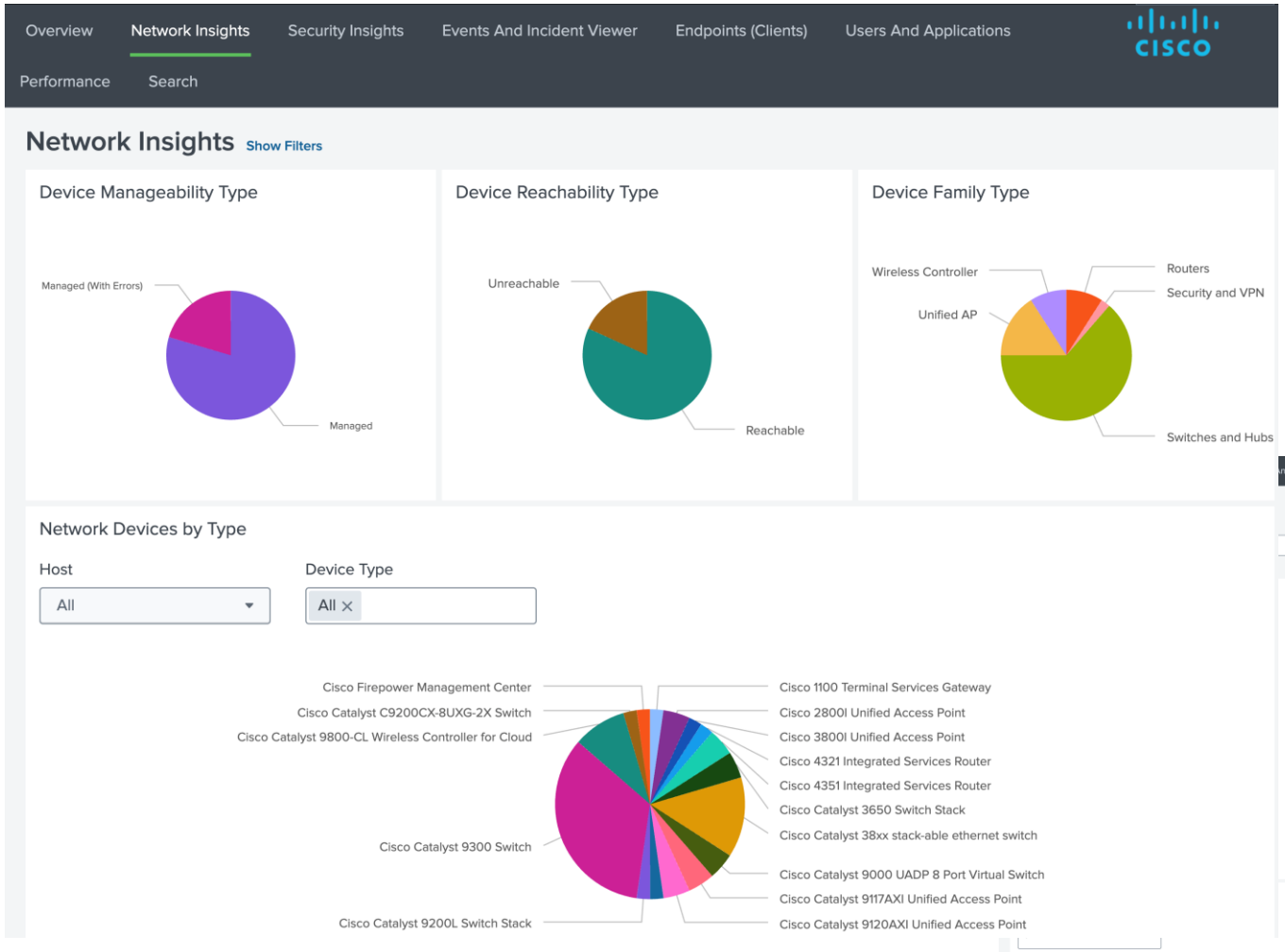
Enterprise Networking for Splunk

Network Insights & Endpoints

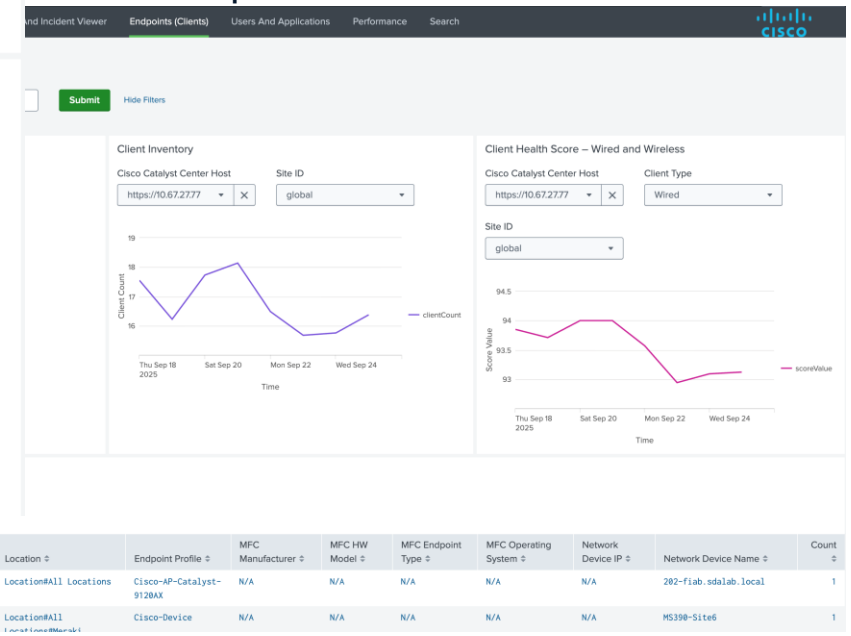


Network Insights

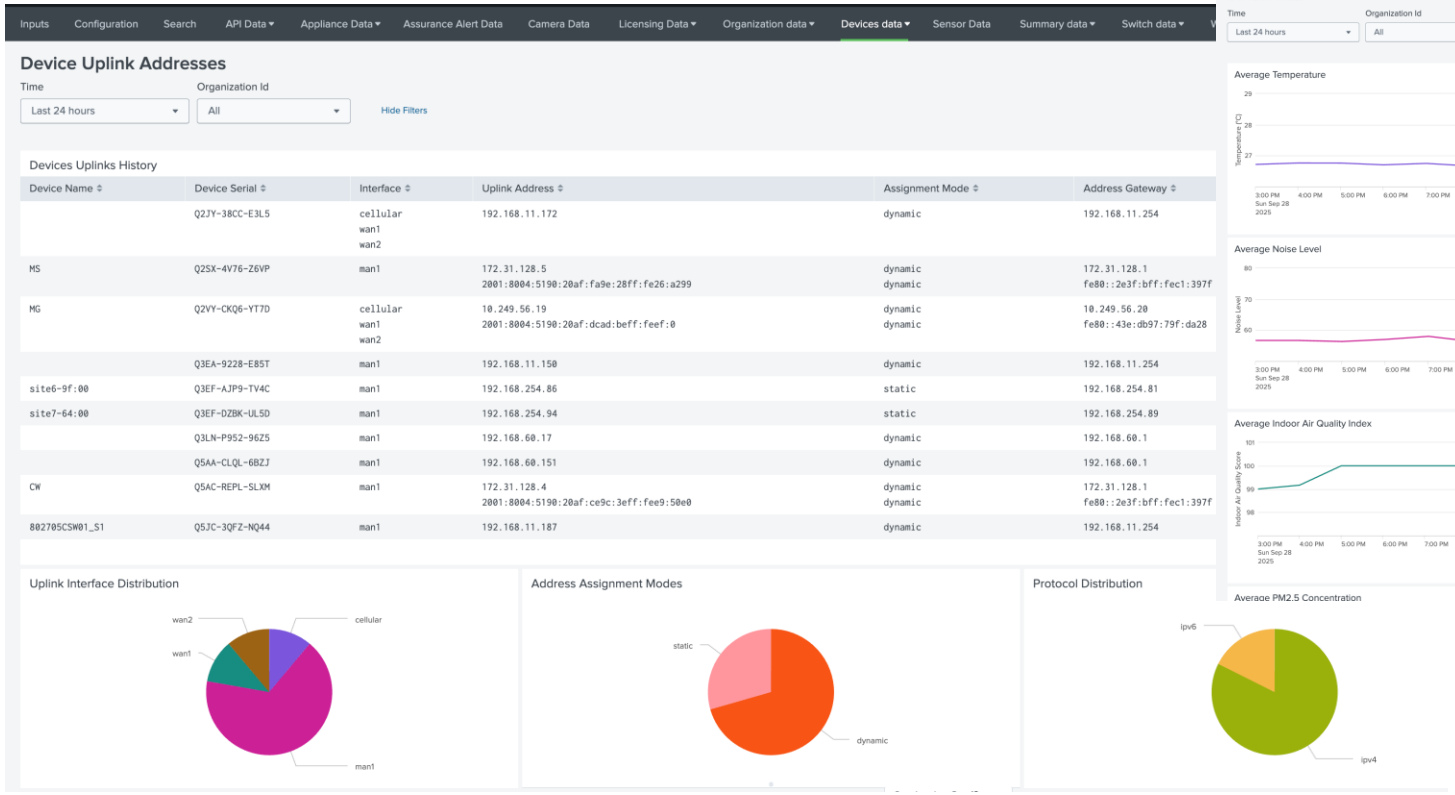
- Provides high-level summary of most pressing issues in the network
- Contains a mix of network and security events across Catalyst Center, ISE and SD-WAN

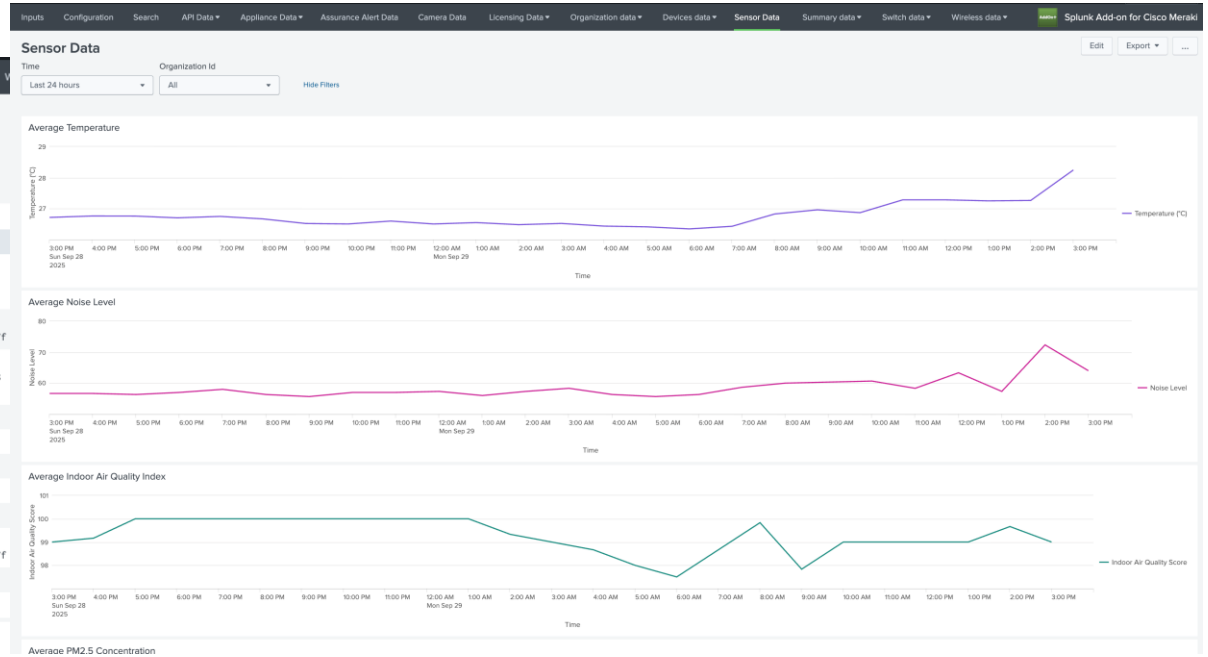
Endpoints

- Health score metrics, endpoint identity summary and endpoint authentication status



Meraki Insights





Devices Data

- Summary of Meraki device change history and uplink information

Sensor Data

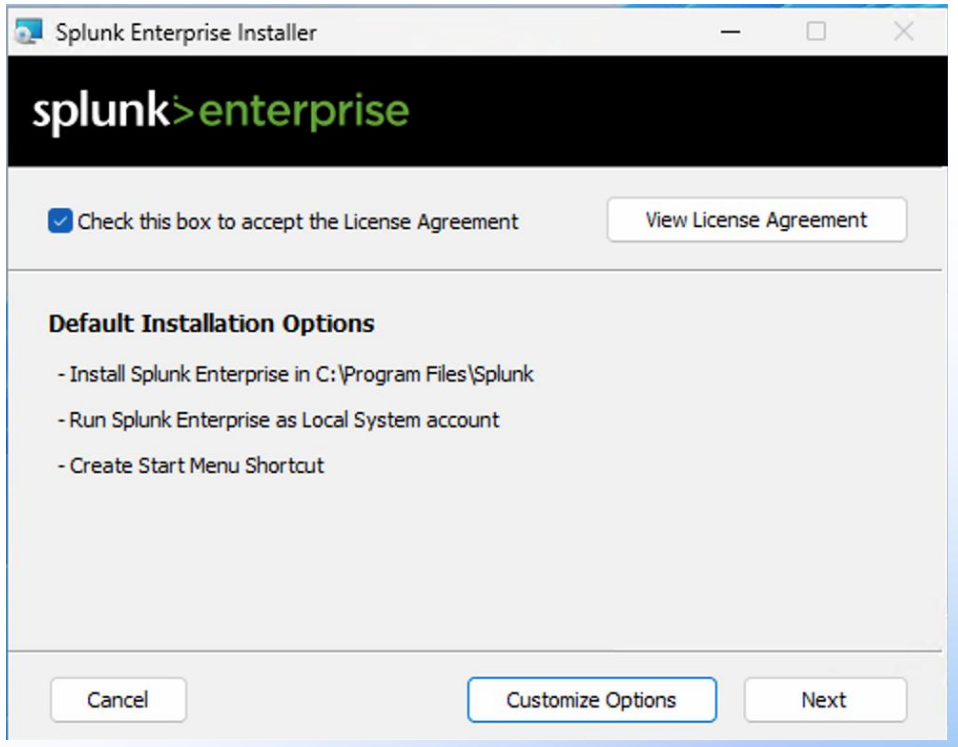
- Provides sensor data from Meraki environmental sensors

Splunk Installation & Getting Started

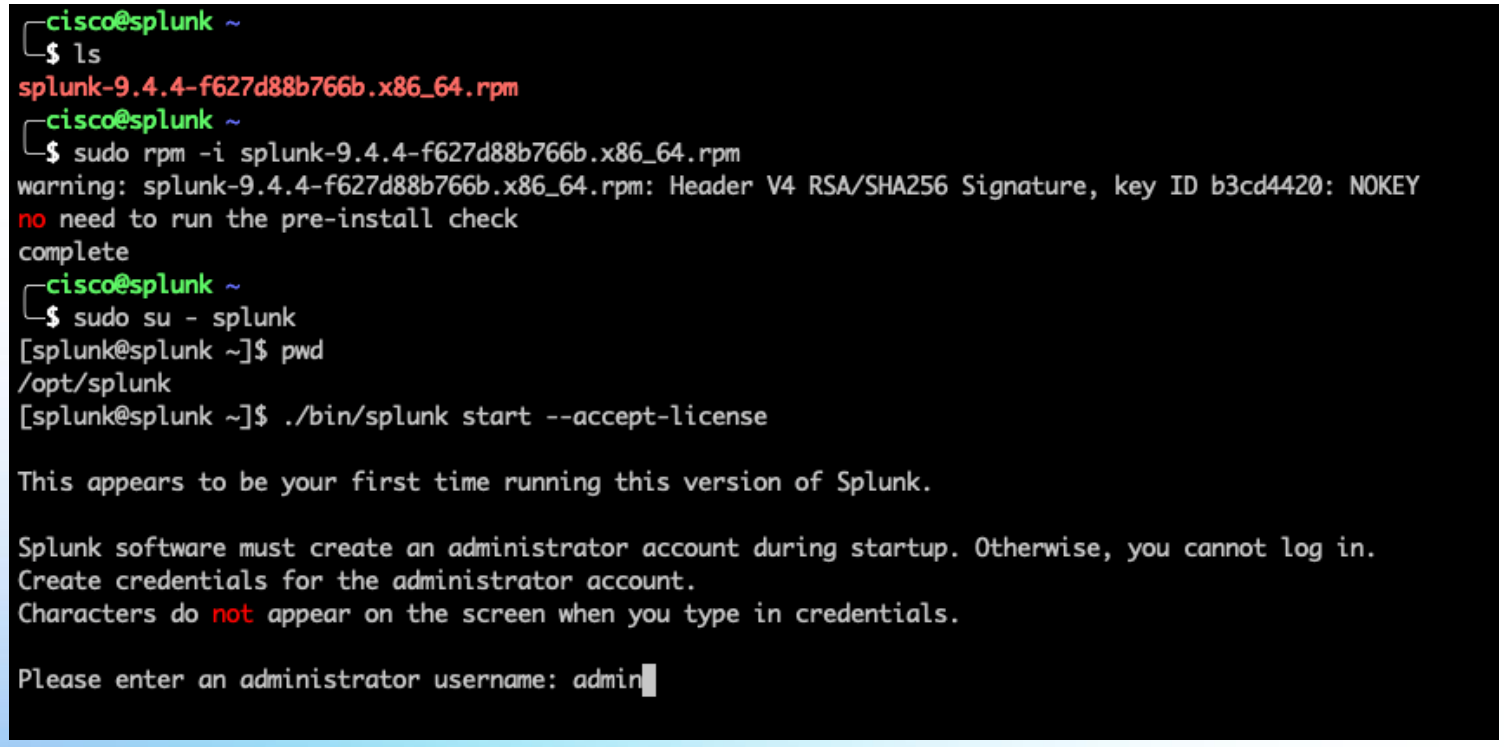
Splunk Enterprise Installation

Windows, Linux, Mac OS

https://www.splunk.com/en_us/download/splunk-enterprise.html



Windows

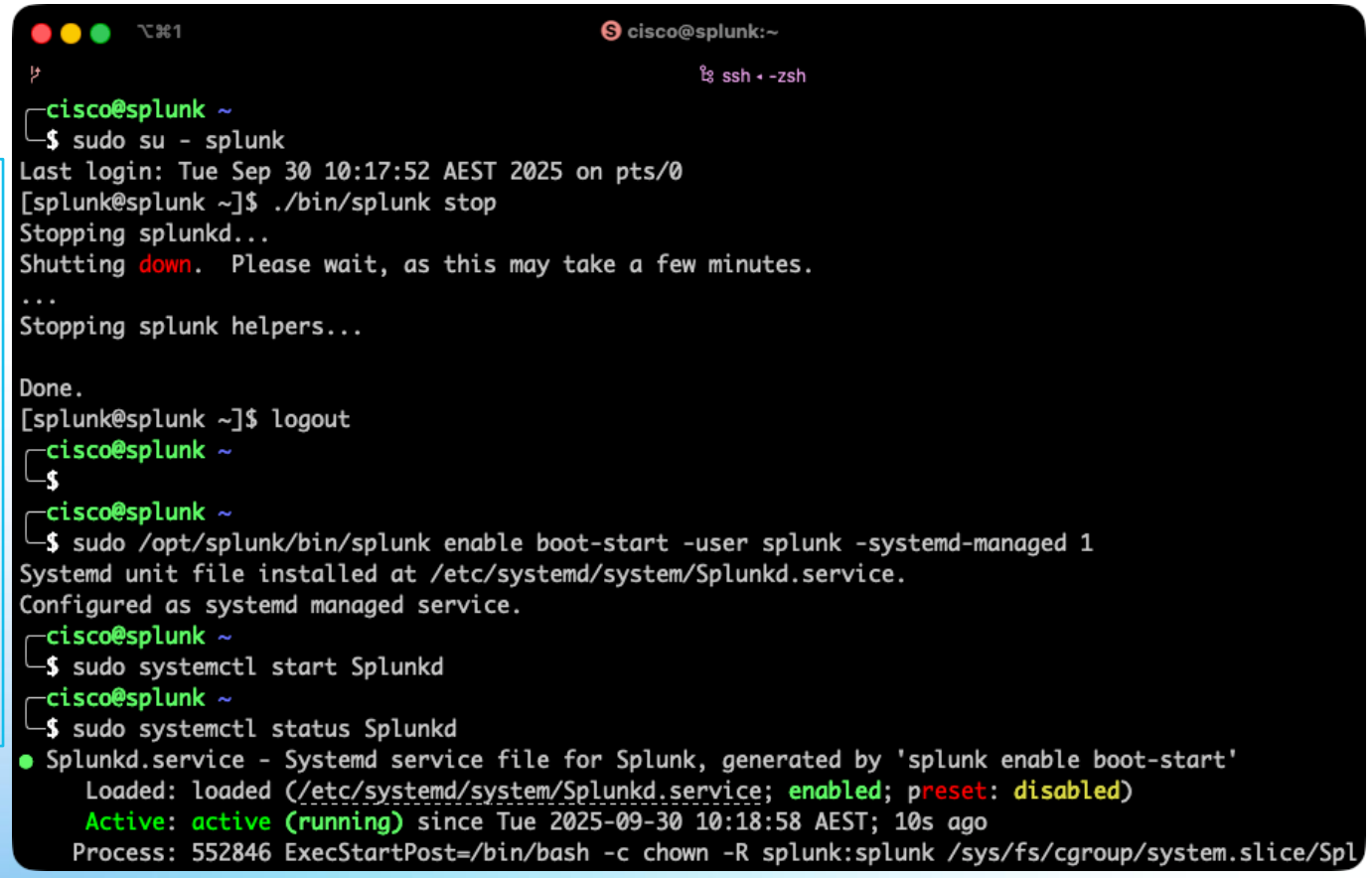


Linux

Splunk Enterprise Installation – Automatic Start

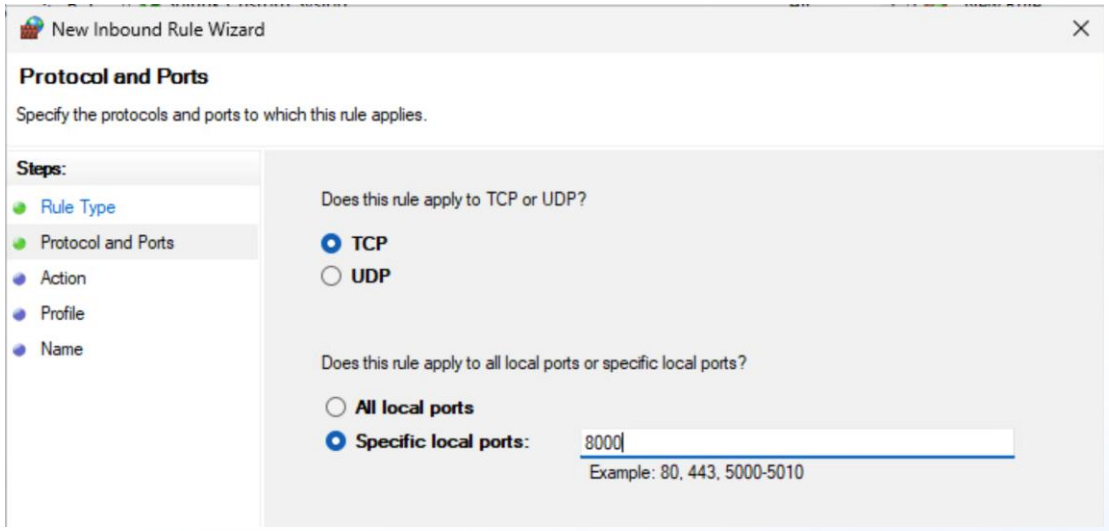
Linux Start on Boot

```
[cisco@splunk ~]$ sudo su – splunk
[splunk@splunk ~]$ ./bin/splunk stop
[splunk@splunk ~]$ logout

[cisco@splunk ~]$ sudo /opt/splunk/bin/splunk
enable boot-start -user splunk -systemd-managed 1

[cisco@splunk ~]$ sudo /systemctl start SplunkD
```

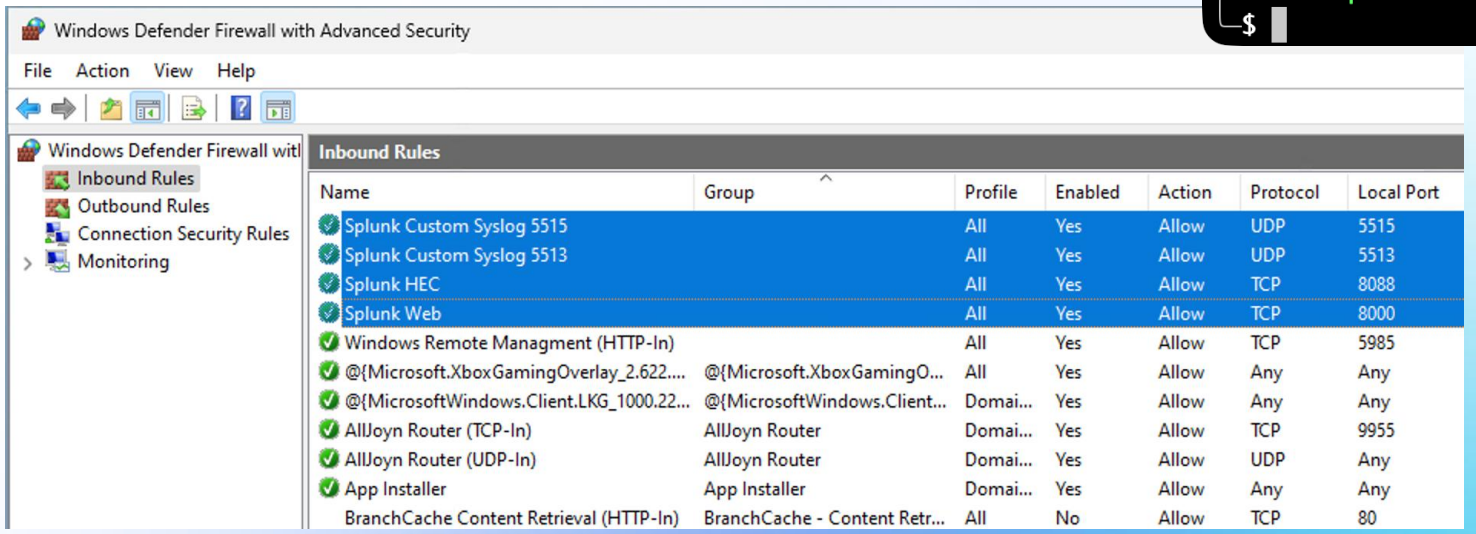


Splunk Enterprise Installation – Firewall

Allow ports for Splunk

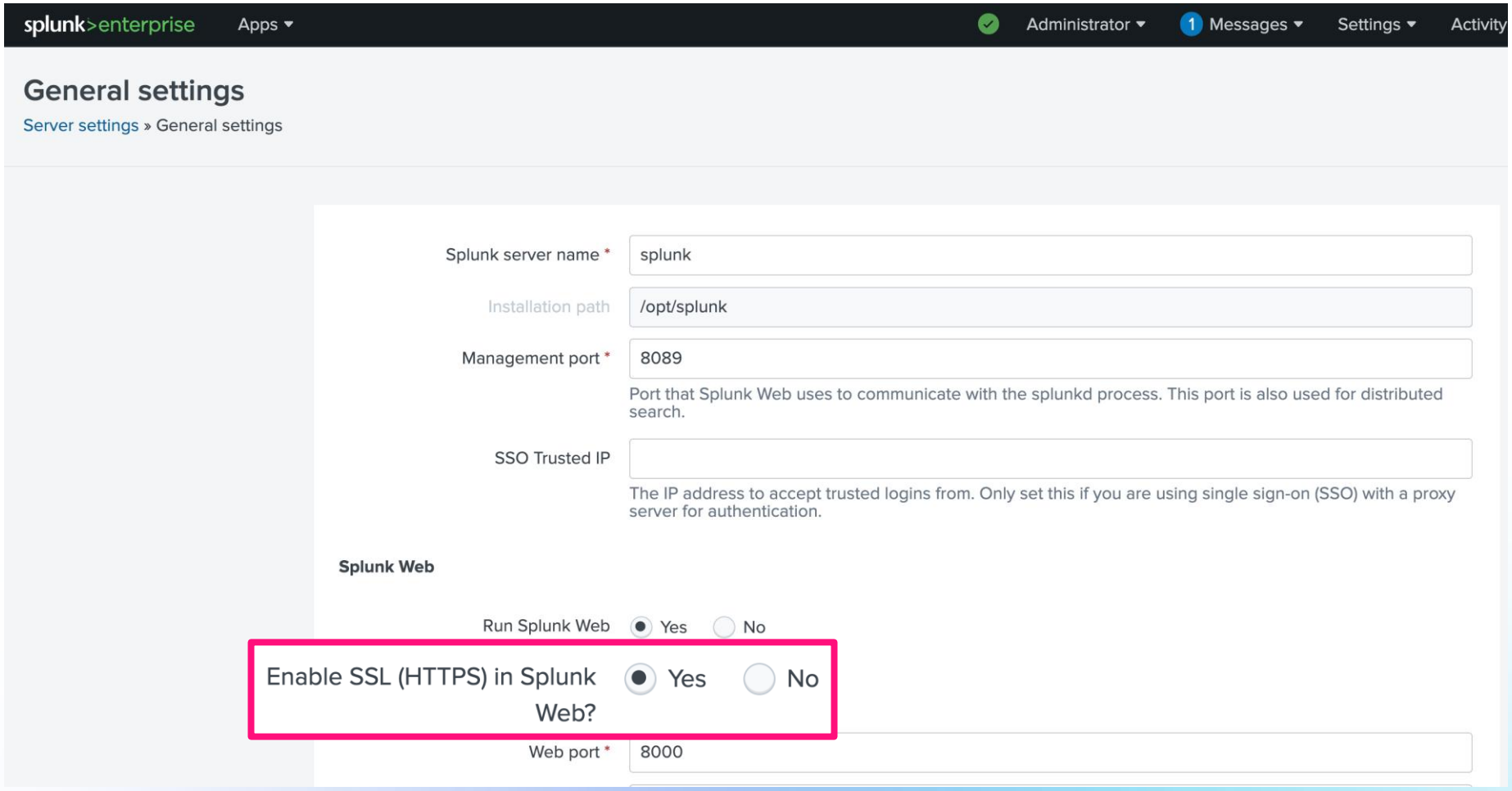



```
cisco@splunk:~
ssh ◂ -zsh
cisco@splunk ~
$ # Splunk Web and HTTP Event Collector
cisco@splunk ~
$ sudo firewall-cmd --zone=public --add-port=8000/tcp --add-port=8088/tcp --permanent
success
cisco@splunk ~
$ # Custom syslogs
cisco@splunk ~
$ sudo firewall-cmd --zone=public --add-port=5513/udp --add-port=5515/udp --permanent
success
cisco@splunk ~
$ sudo firewall-cmd --reload
success
cisco@splunk ~
$
```



- Splunk Web default port 8000
- HTTP Event Collector
- Custom ports as required

Splunk Enterprise Installation – Enable HTTPS



Splunk Web

- HTTP is enabled by default – enable **HTTPS** for added security

Splunk Technology Add-Ons (TAs)

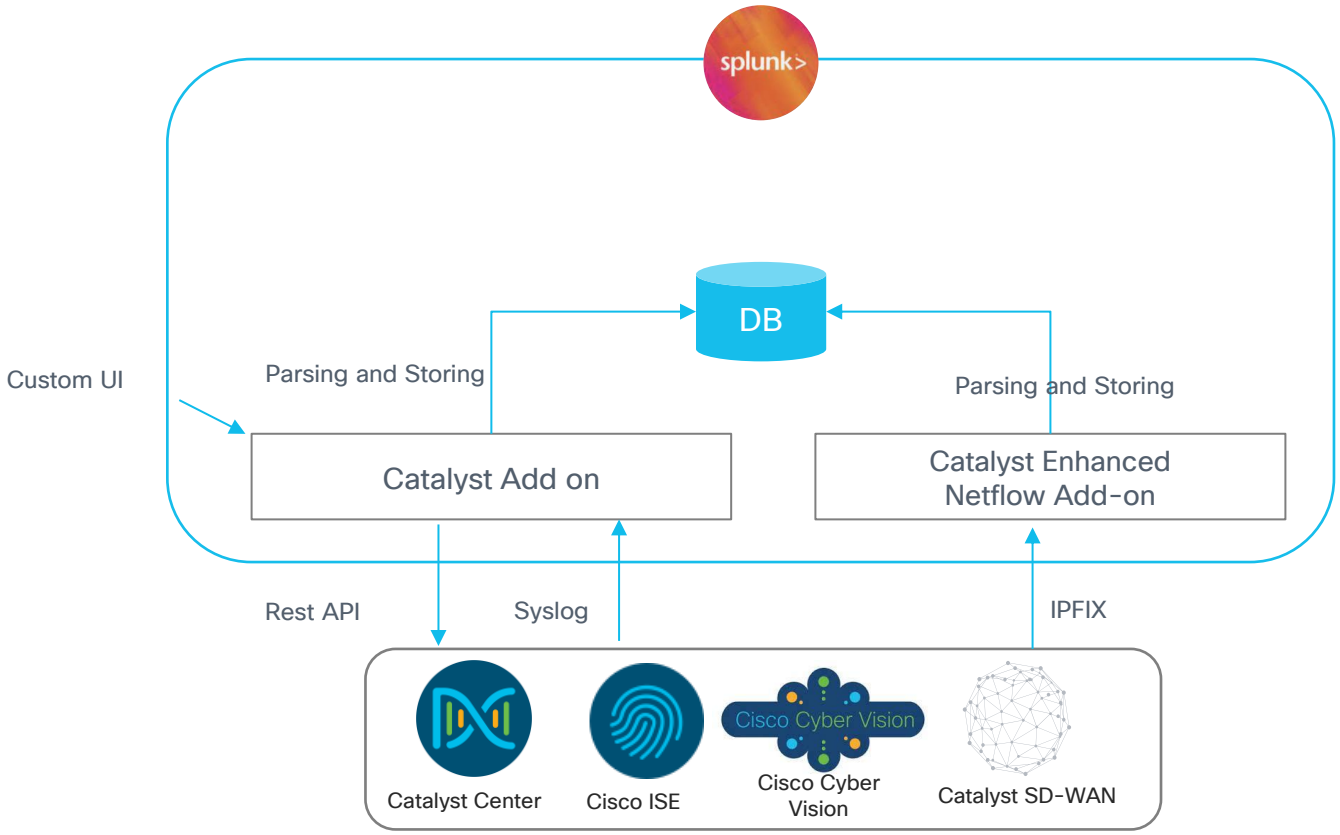
Splunk Apps and Technology Add-Ons

Collects, formats, and normalizes data from a specific technology source

https://splunkbase.splunk.com

Catalyst Add-On

Technical Add-On Architecture

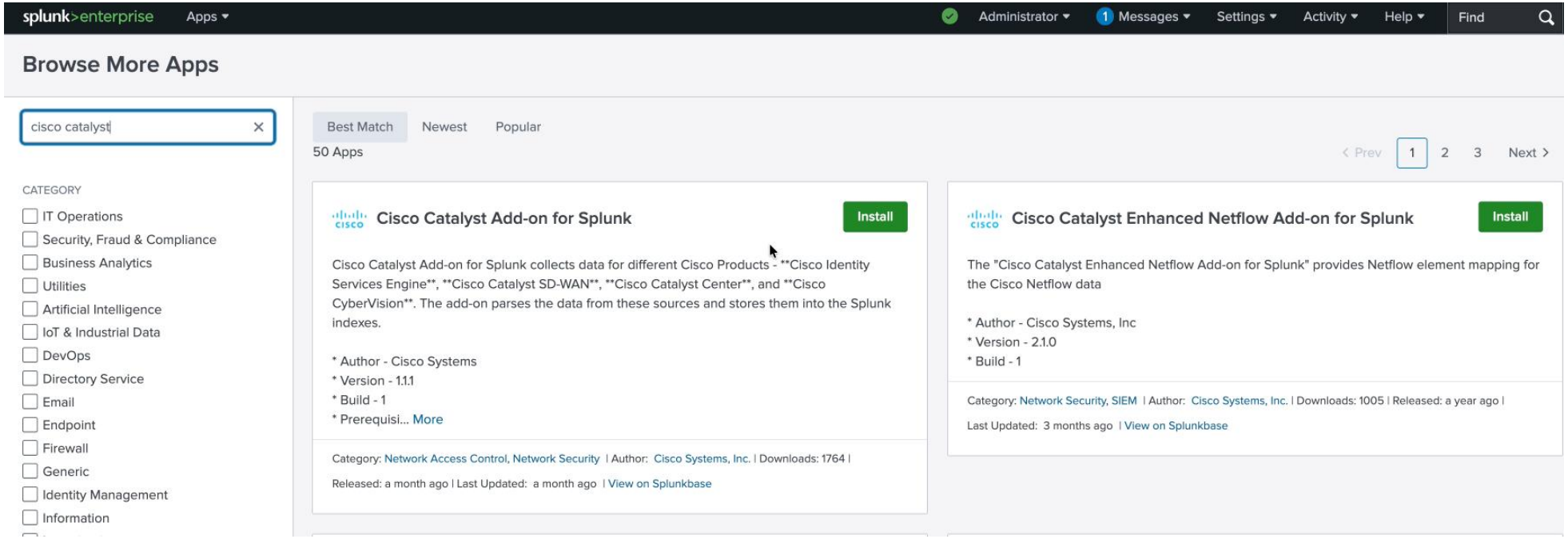


Two TAs used for ingesting telemetry

- Catalyst Add on – Processes API, Syslog and Netflow v10
- Enhanced Netflow Add on – Processes Netflow v9
- TAs adhere to the Splunk gold standard
- Conforms to CIM (common information model) for many of the data ingested
- Catalyst App
- Dashboard with preconfigured charts to visualize data
- Help monitor notifications, events and logs from multiple enterprise networking products on a single pane of glass – covers both the network infrastructure and controllers

Cisco Catalyst Add-On for Splunk

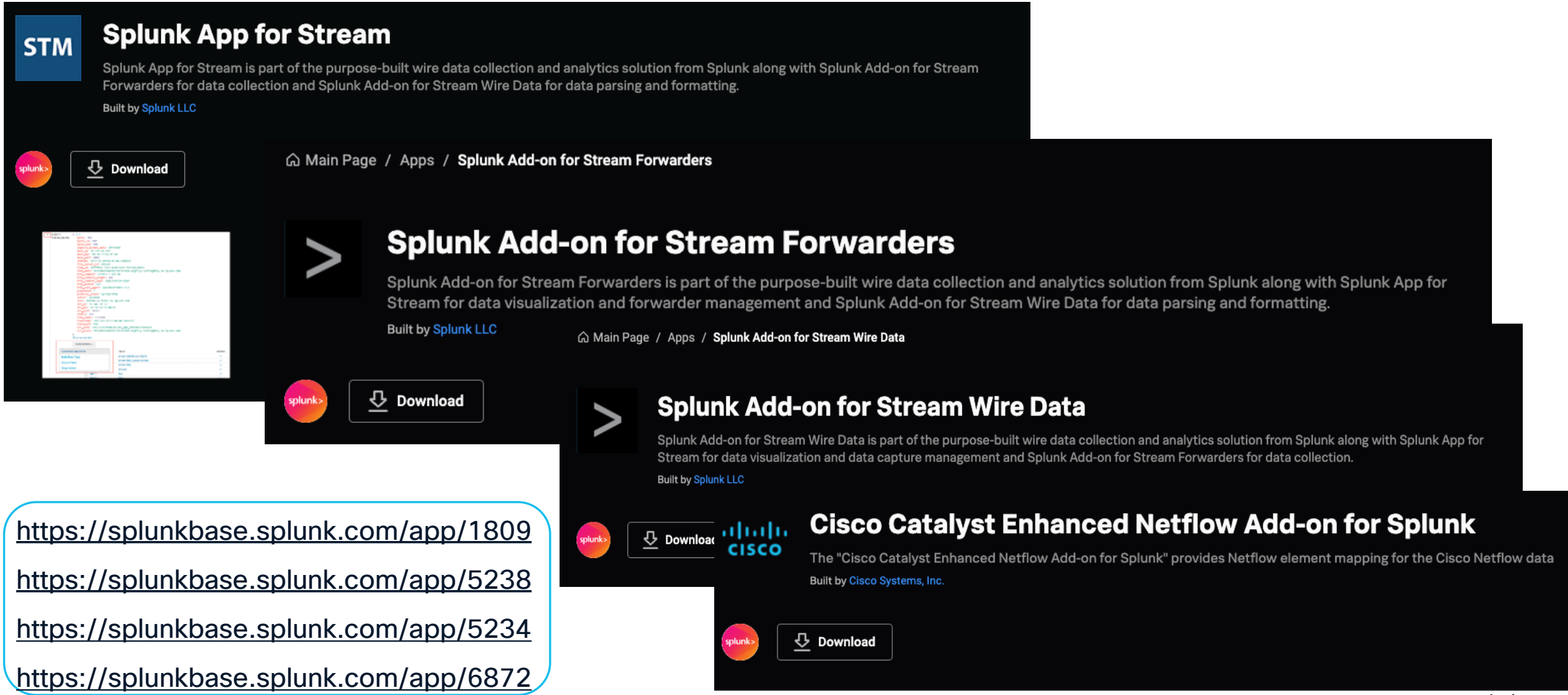
Parses the data from specified sources and stores them into the Splunk indexes



- Cisco Catalyst Center
- Cisco Identity Services Engine
- Cisco Catalyst SD-WAN
- Cisco Cyber Vision

Cisco Catalyst Add-On for Splunk – Stream

Install the pre-requisite apps & add-ons



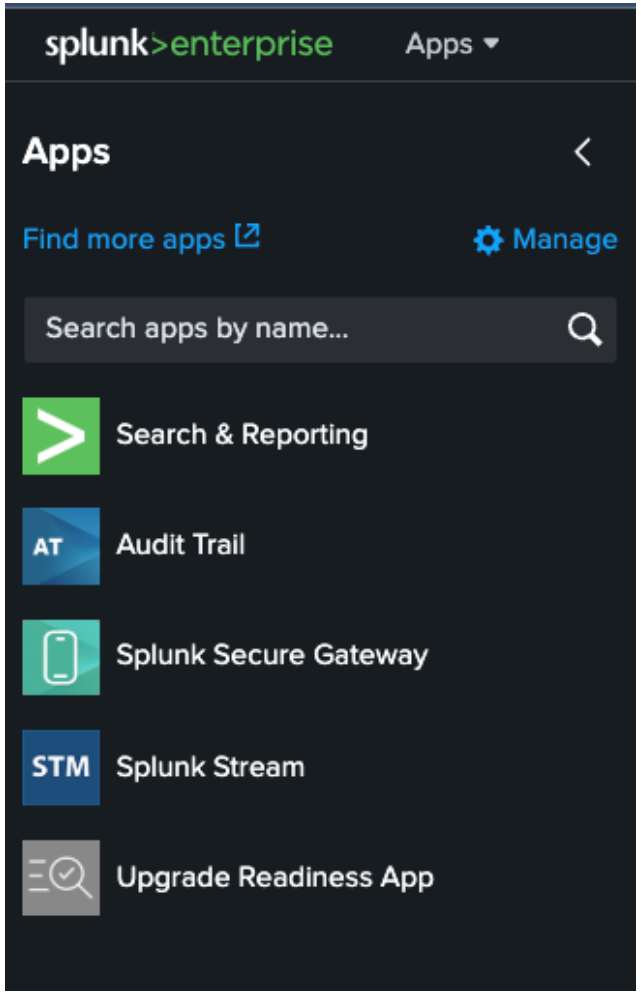
https://splunkbase.splunk.com/app/1809

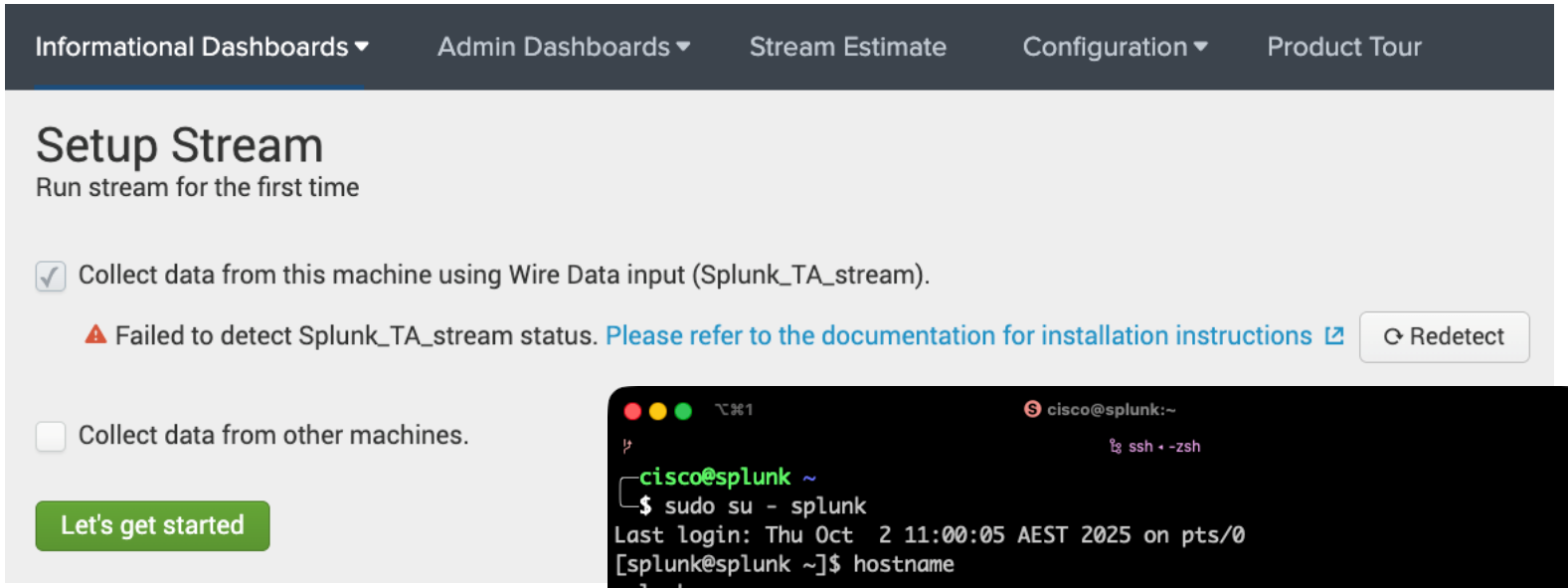
https://splunkbase.splunk.com/app/5238

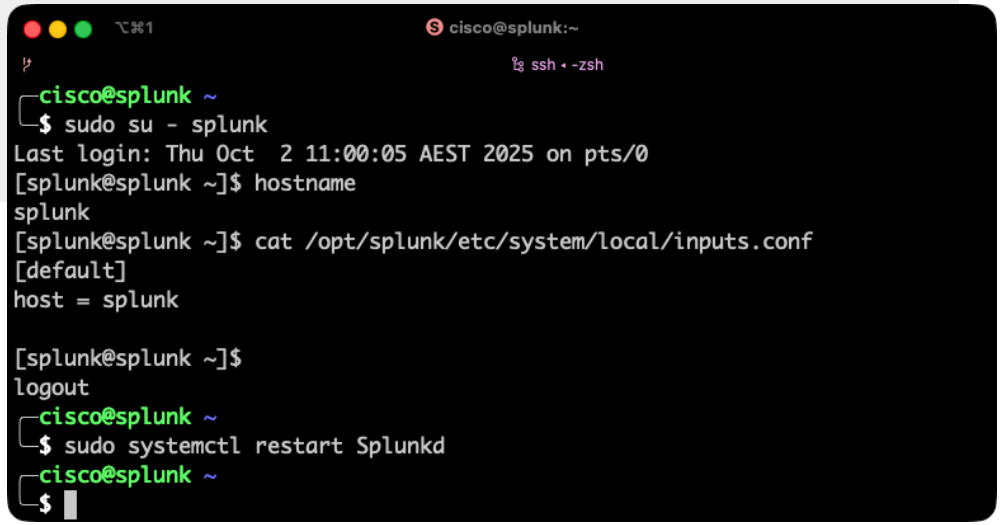
https://splunkbase.splunk.com/app/5234

https://splunkbase.splunk.com/app/6872

Cisco Catalyst Add-On for Splunk – Stream





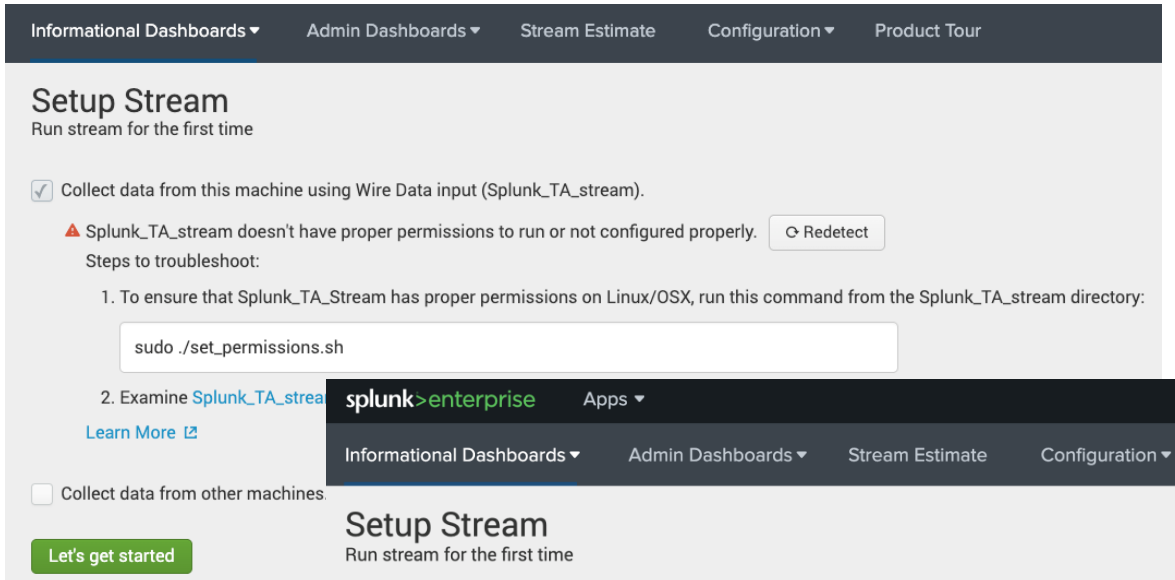


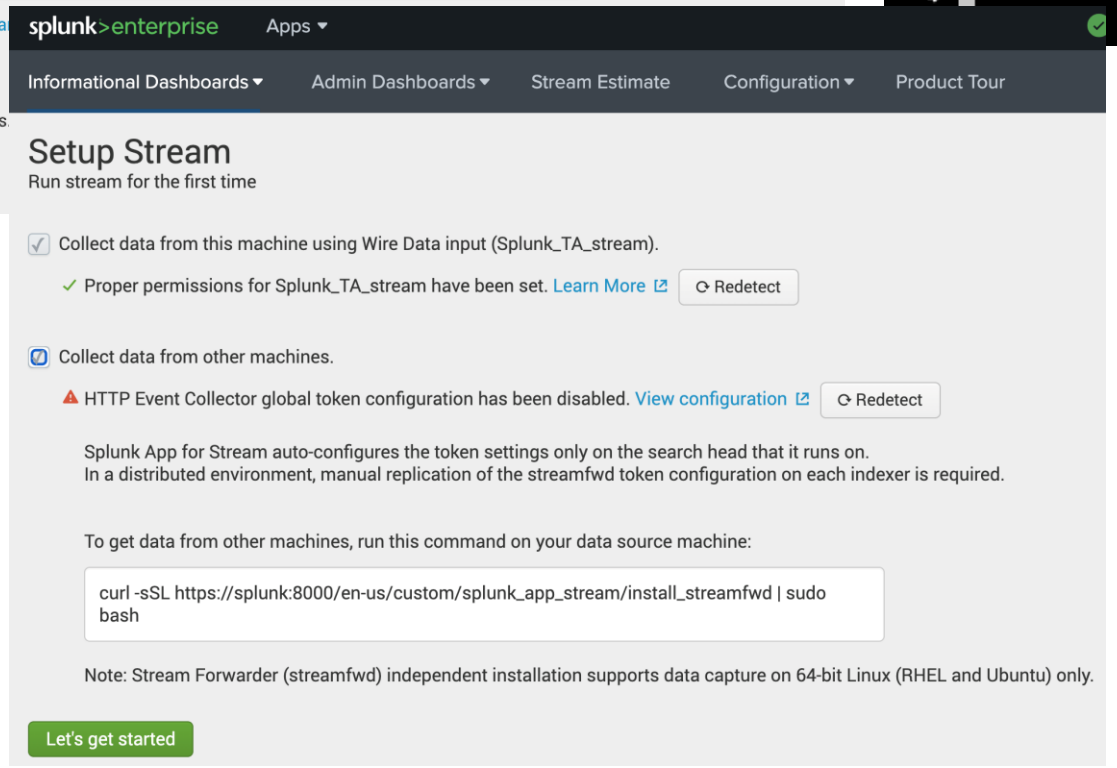
Step 1 – Install Splunk Stream TAs

Step 2 – Add hostname to /opt/splunk/etc/system/local/inputs.conf

Step 3 – Restart Splunk

Cisco Catalyst Add-On for Splunk – Stream



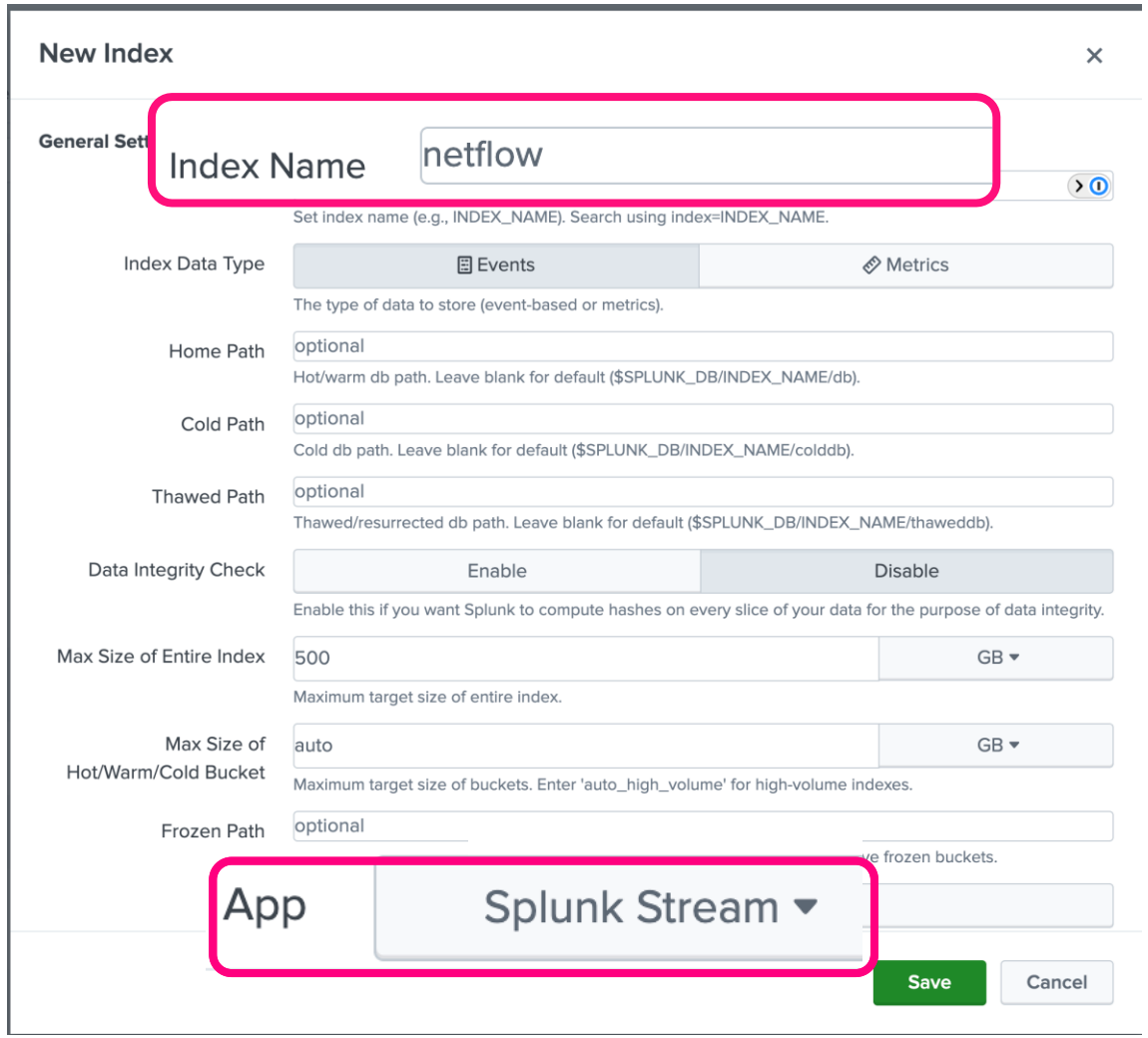


Step 4 – Make set_permissions.sh executable

Step 5 – Run set_permissions.sh

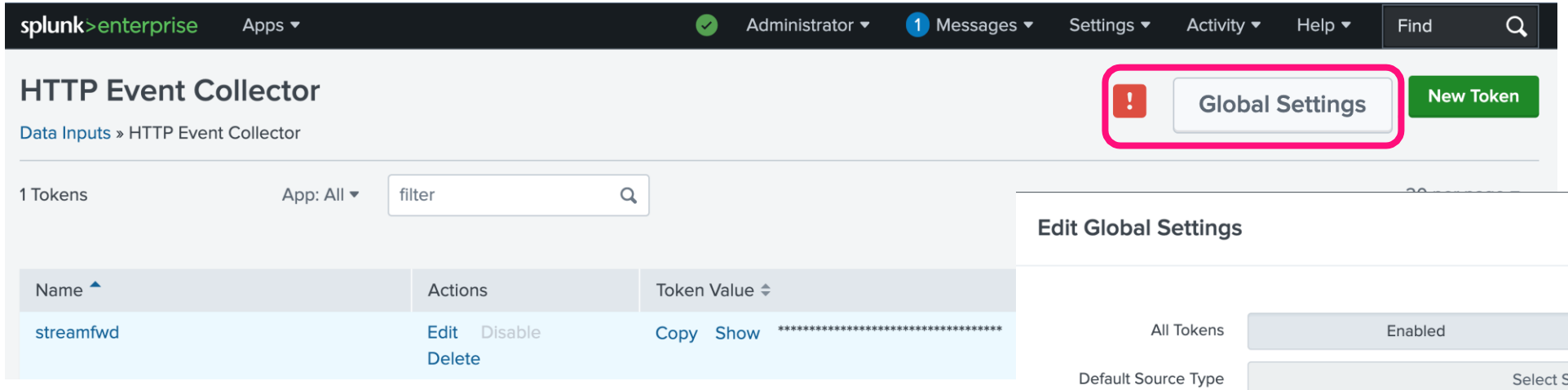
Step 6 – Setup stream forwarder (hidden slides)

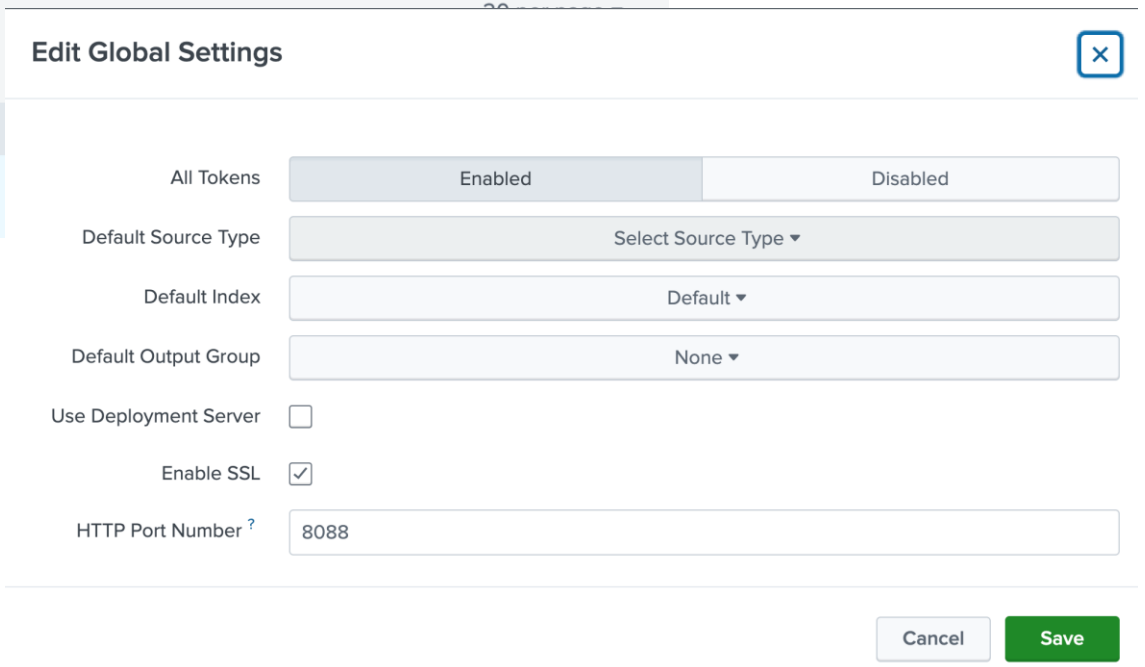
Cisco Catalyst Add-On for Splunk – Indexes



Step 7 – Create an index for NetFlow

Splunk HTTP Event Collector

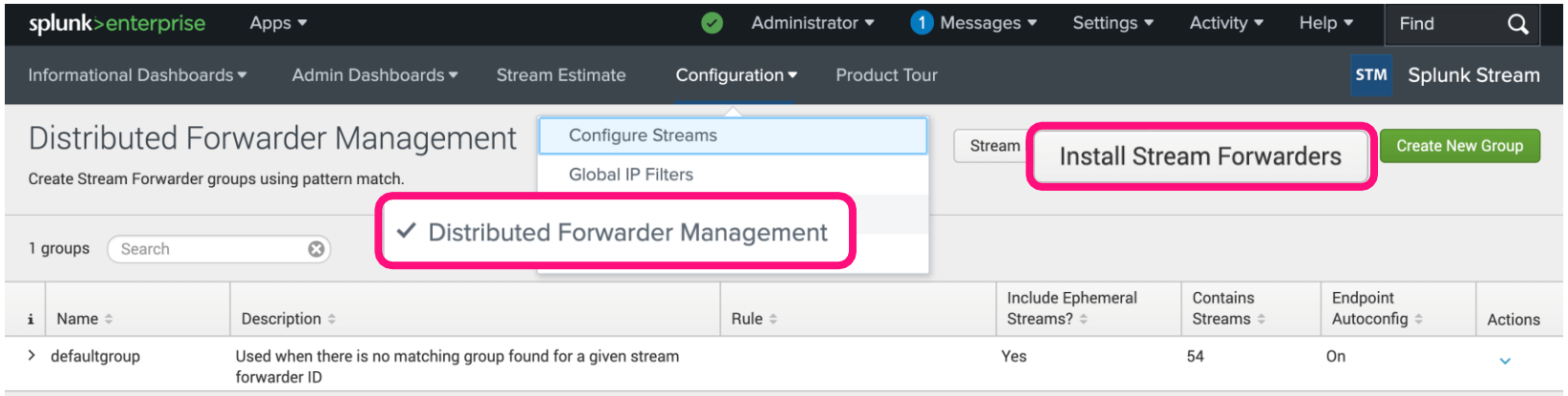


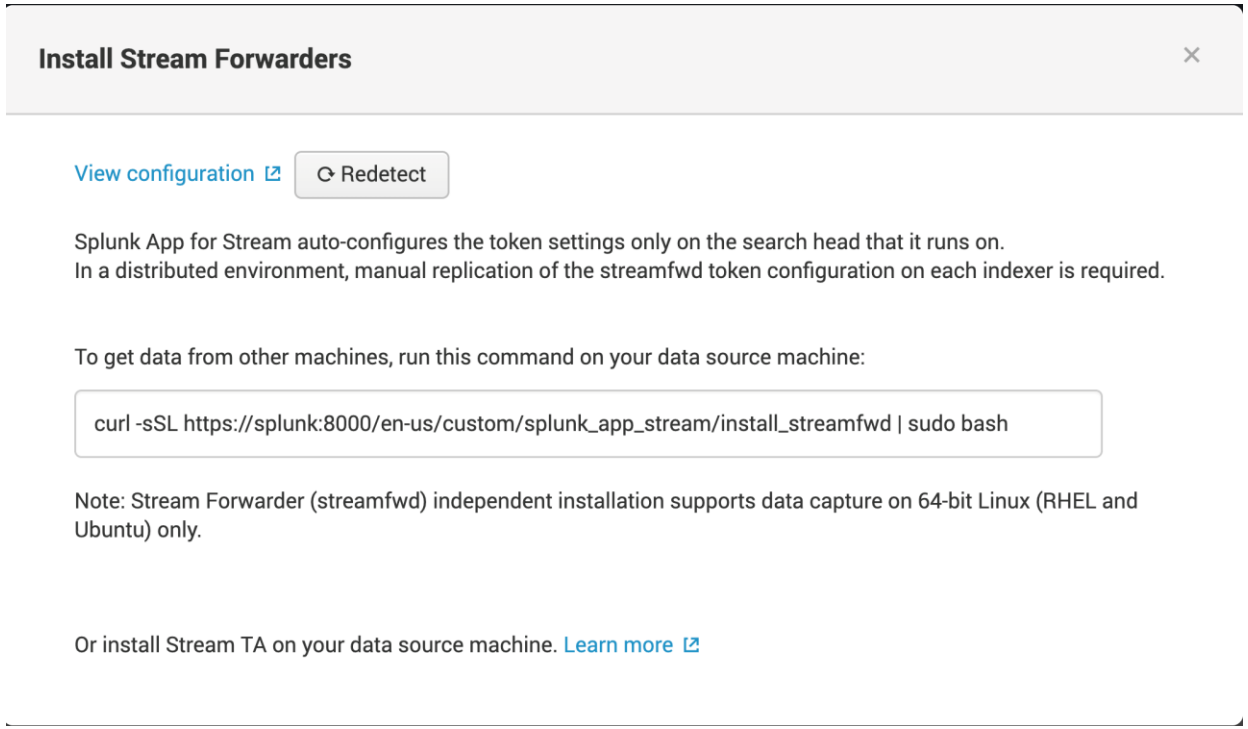


Step 8 – Enable HEC globally

Step 9 – Create a HEC for the NetFlow Stream Forwarder

Stream forwarder





- Copy the setup script text from ‘Install Stream Forwarders’ and install on a dedicated Linux machine

Stream forwarder

```
cisco@streamfwd ~
$ curl -ksSL https://splunk:8000/en-us/custom/splunk_app_stream/install_streamfwd | sudo bash
This script will download and install Splunk Stream Forwarder 8.1.5; do you want to continue (yes/no)? [yes]
downloading splunkstreamfwd-8.1.5-0a64891e.linux64.tar.bz2 package from https://splunk:8000/en-us/custom/splunk_app
_stream/install_streamfwd/linux64 ..
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 45.0M  100 45.0M    0     0   121M      0 --:--:-- --:--:-- --:--:--  121M
splunkstreamfwd-8.1.5/
```

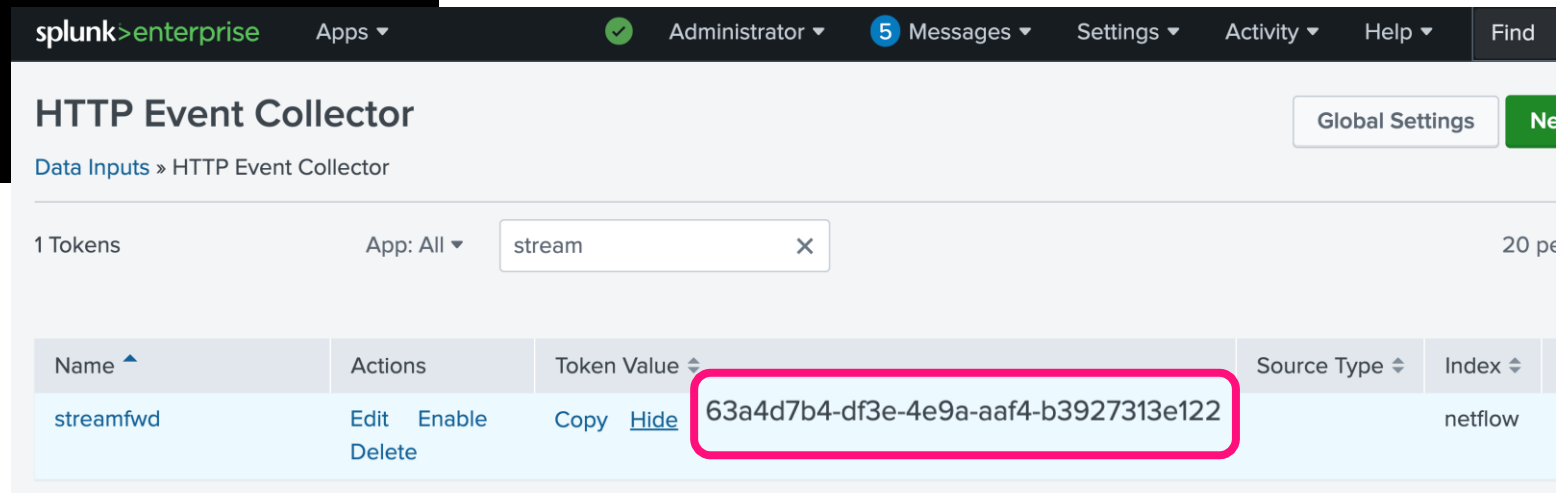
```
⌥⌘1  cisco@streamfwd:~
                                                    ssh ◂ -zsh
~ (ssh)
cisco@streamfwd ~
$ sudo firewall-cmd --zone=public --add-port=9997/udp --permanent
success
cisco@streamfwd ~
$ sudo firewall-cmd --reload
success
cisco@streamfwd ~
$ sudo firewall-cmd --list-ports
9997/udp
cisco@streamfwd ~
$
```

- Run the installer script on the stream forwarder
- Allow the NetFlow port through the firewall on Linux if required

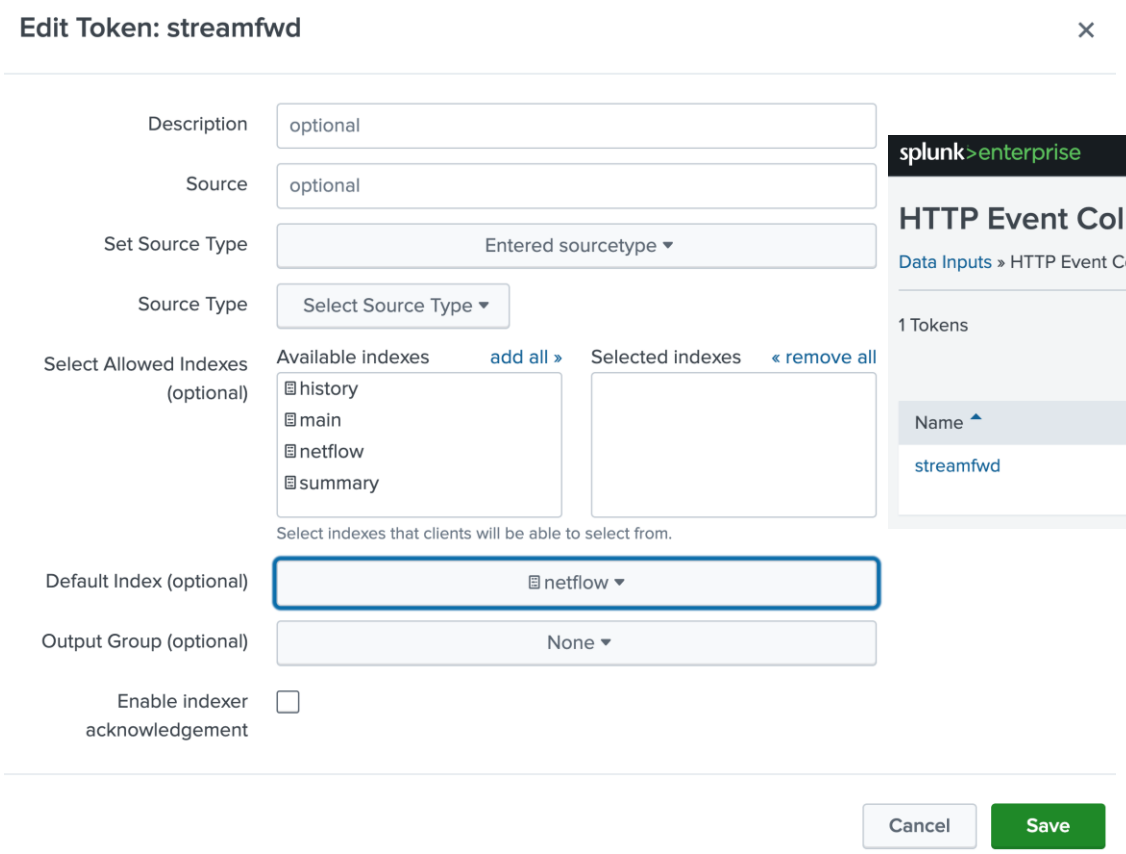
Stream forwarder

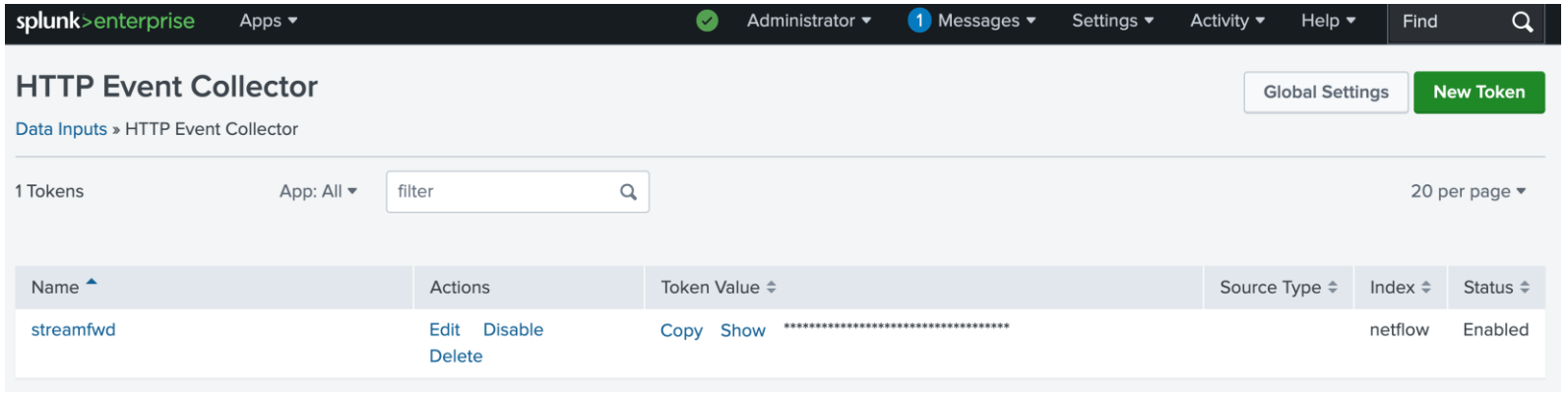
```
⌥⌘1  cisco@streamfwd:~
                                                    ssh ◂ -zsh
~ (ssh)
cisco@streamfwd ~
$ sudo cat /opt/streamfwd/local/streamfwd.conf
[streamfwd]
# My local IP address
ipAddr = 10.67.27.69

httpEventCollectorToken = 63a4d7b4-df3e-4e9a-aaf4-b3927313e122
indexer.0.uri = https://10.67.27.231:8088

netflowReceiver.0.ip = 10.67.27.69
netflowReceiver.0.port = 9997
netflowReceiver.0.decoder = netflow

cisco@streamfwd ~
$ ping splunk
PING splunk (10.67.27.231) 56(84) bytes of data.
64 bytes from splunk (10.67.27.231): icmp_seq=1 ttl=64
^C
```

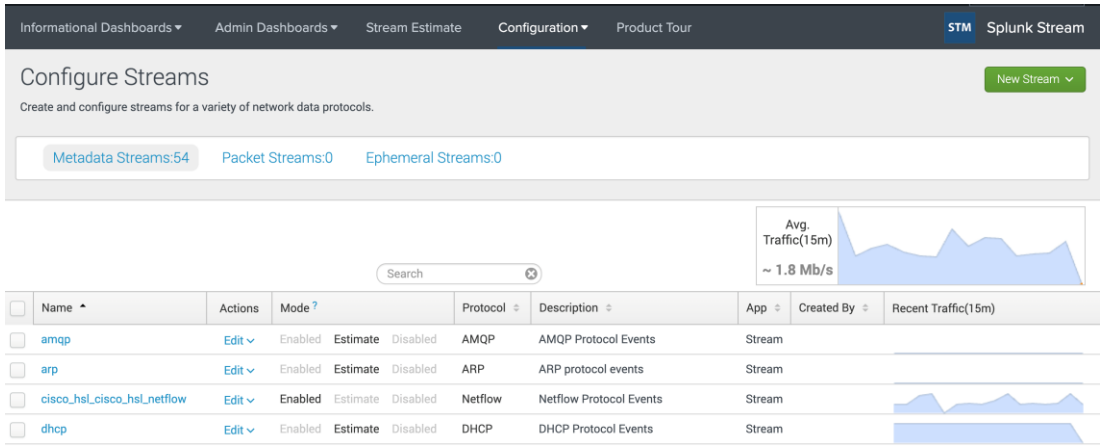
- Create a local streamfwd.conf file
- Specify the HEC token on Splunk for the stream forwarder in the stream forwarder configuration file
- Restart the stream forwarder



Splunk HTTP Event Collector



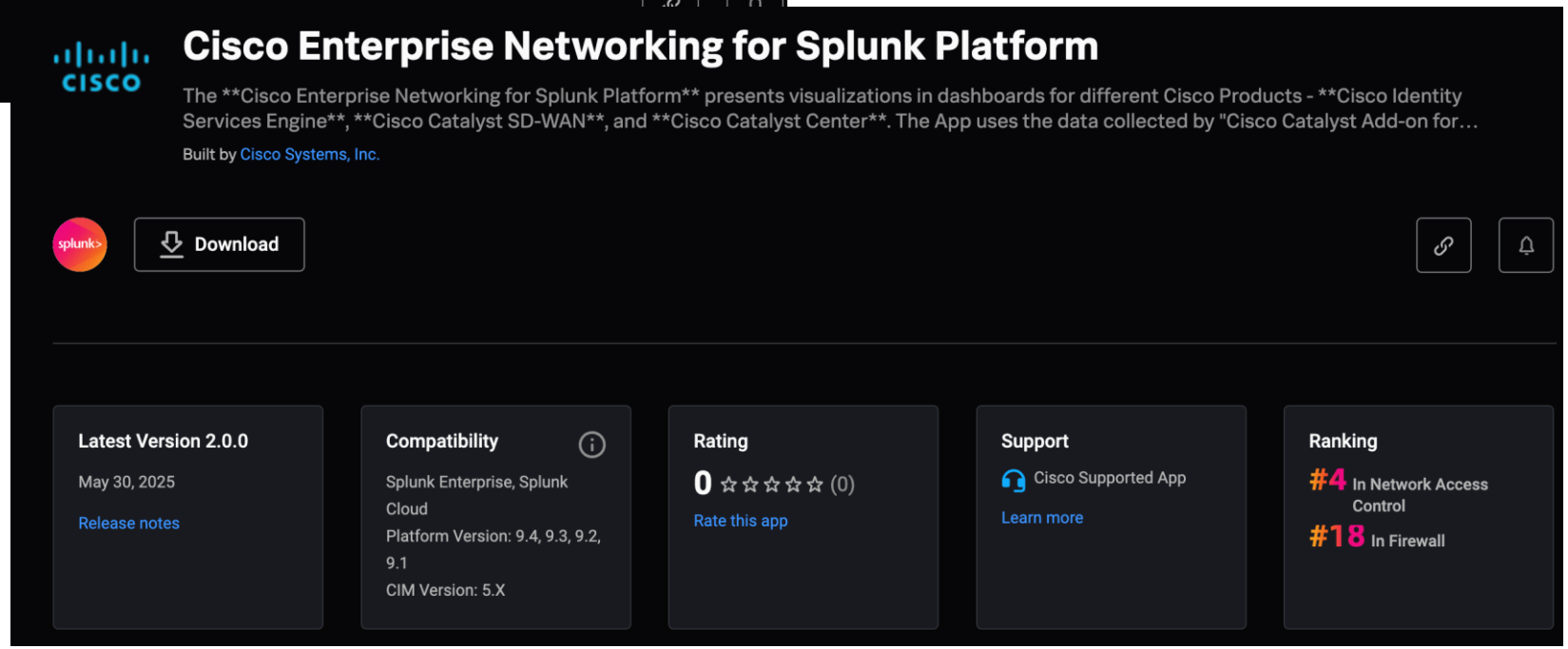




Step 10 – Set the streamfwd HEC to use the netflow index

Enterprise Networking App & Catalyst Add-On

Cisco Catalyst & Enterprise Networking Add-Ons for Splunk



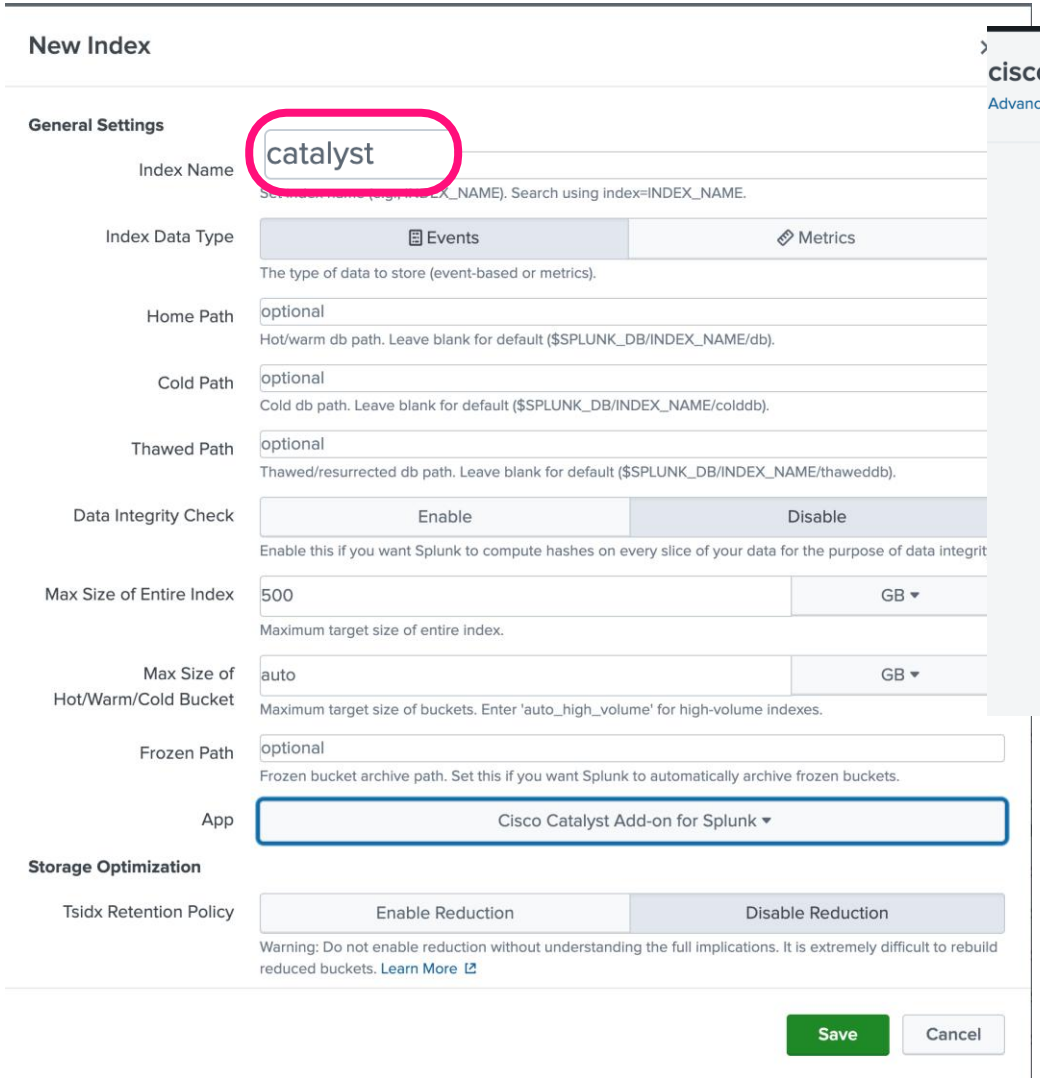
- Catalyst Add-on – Parses data from from specified sources and stores then into Splunk indexes
- Enterprise Networking – Presents visualizations in dashboards based on the Catalyst Add-on

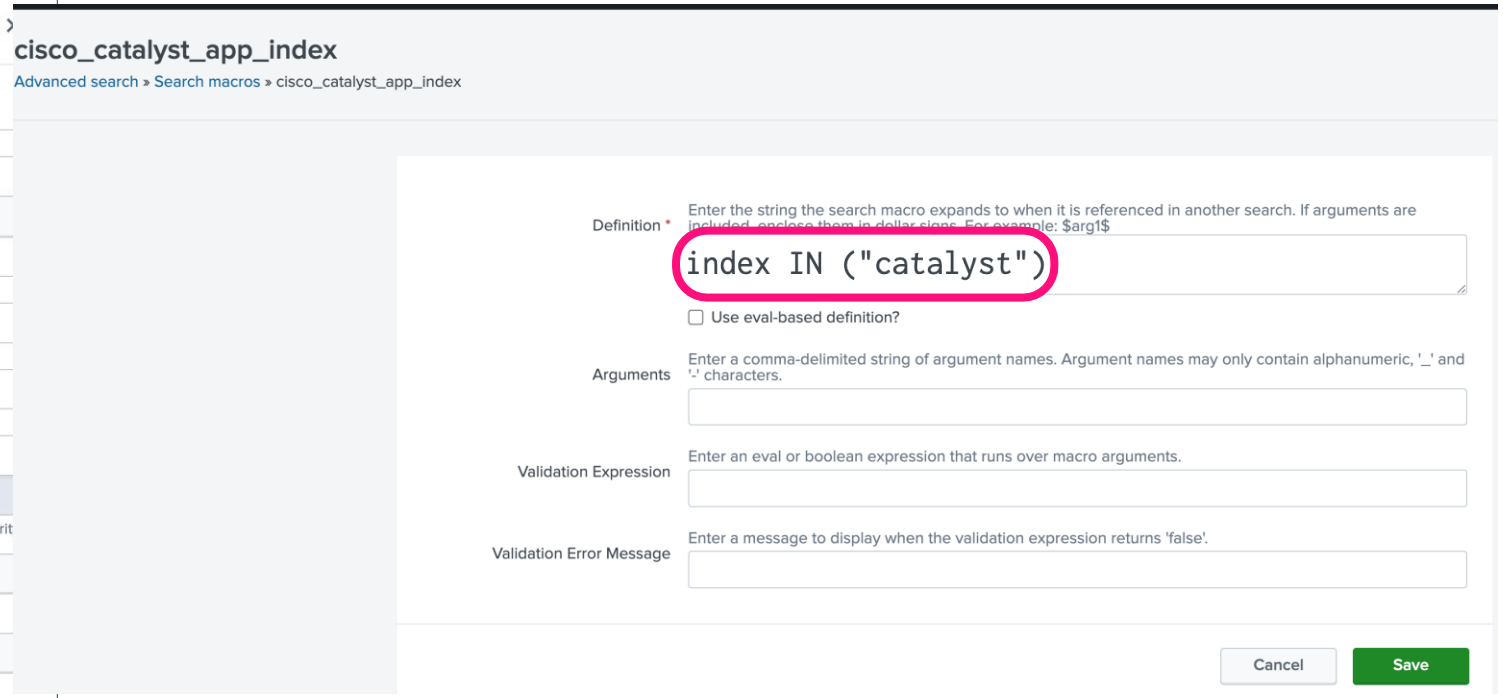
https://splunkbase.splunk.com/app/7538

https://splunkbase.splunk.com/app/7539

Cisco Catalyst Add-On for Splunk – Indexes

Store data from Catalyst Add-on to a dedicated Splunk index





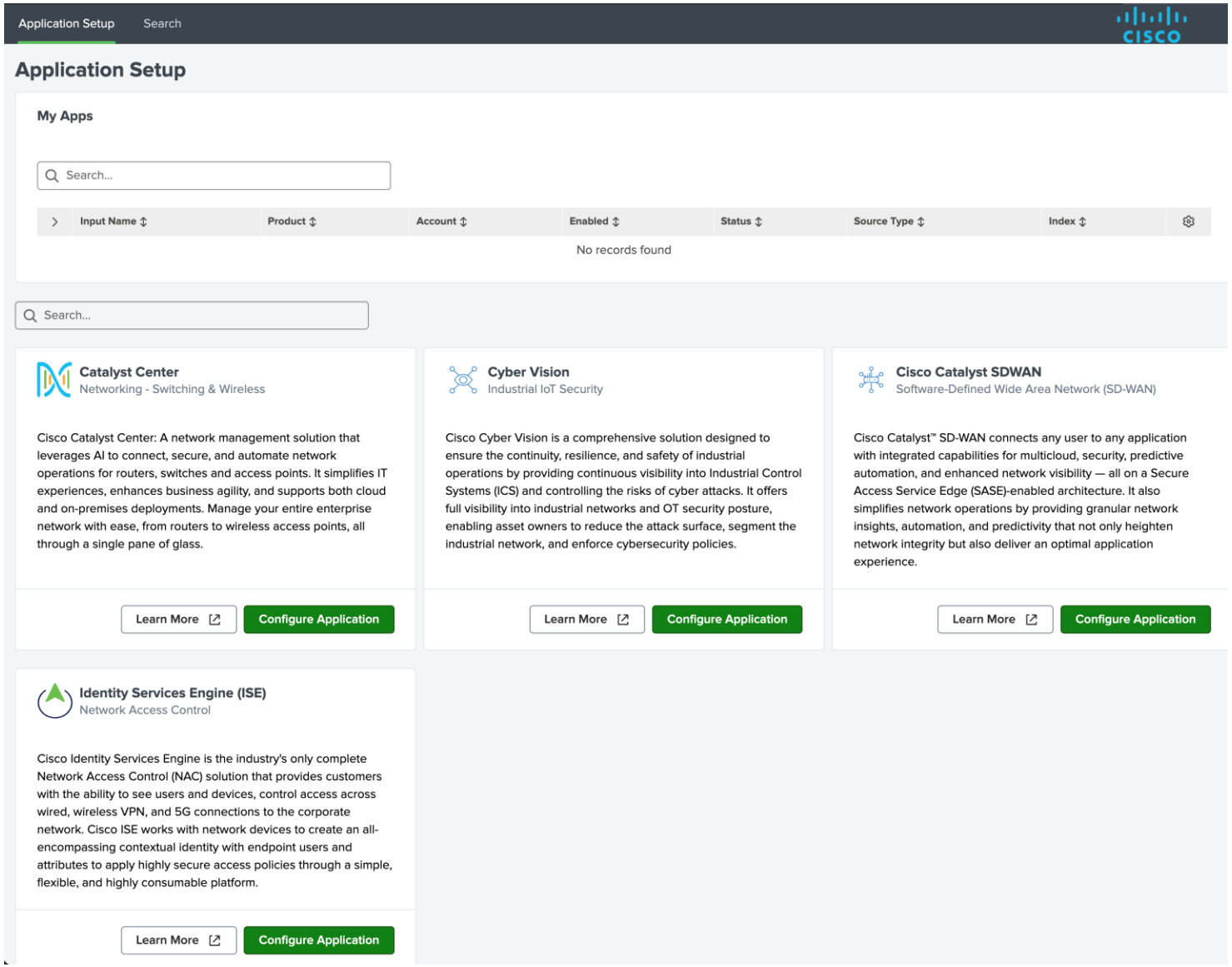
Splunk Index

- It is recommended to have a dedicated Splunk index for an application. A Splunk index is a repository where Splunk stores data.

Search Macro

- Adjust the cisco_catalyst_app_index to use the dedicated Splunk index.

Cisco Catalyst Add-On for Splunk



Catalyst Center

- Facilitates the collection of network inventory, assurance data, event notifications, and audit logs from Catalyst Center

Catalyst SD-WAN

- Collects various types of Cisco SD-WAN log and NetFlow data

Identity Service Engine

- Collects and normalizes ISE data for ingestion into Splunk

Cyber Vision

- Enables integration by pulling device, events, activities, flows, and vulnerability information from Cisco Cyber Vision via REST API

Catalyst Center

Catalyst App – Catalyst Center

Send Catalyst Center Data to Splunk

Catalyst Center

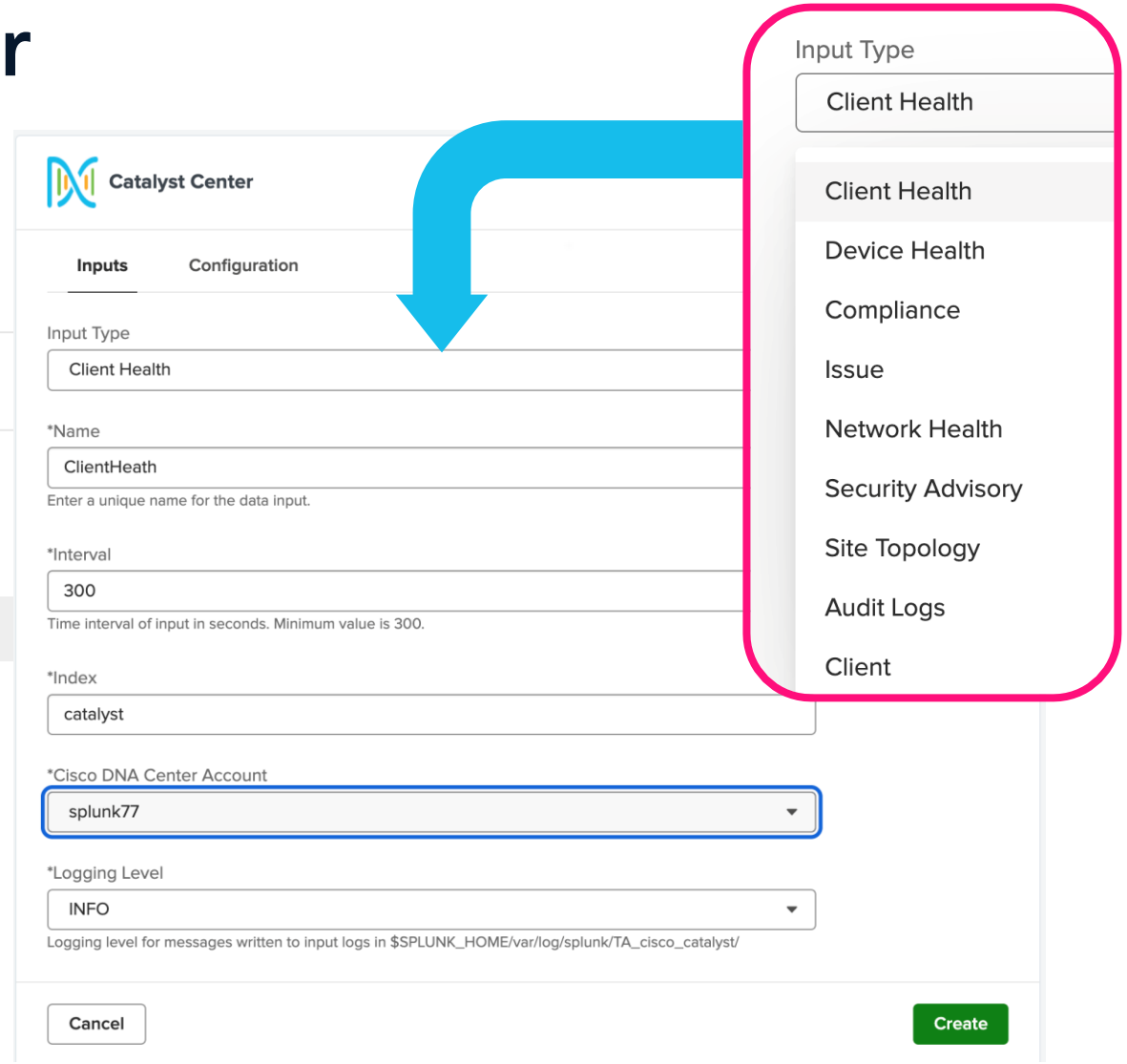
Inputs | **Configuration**

Search...

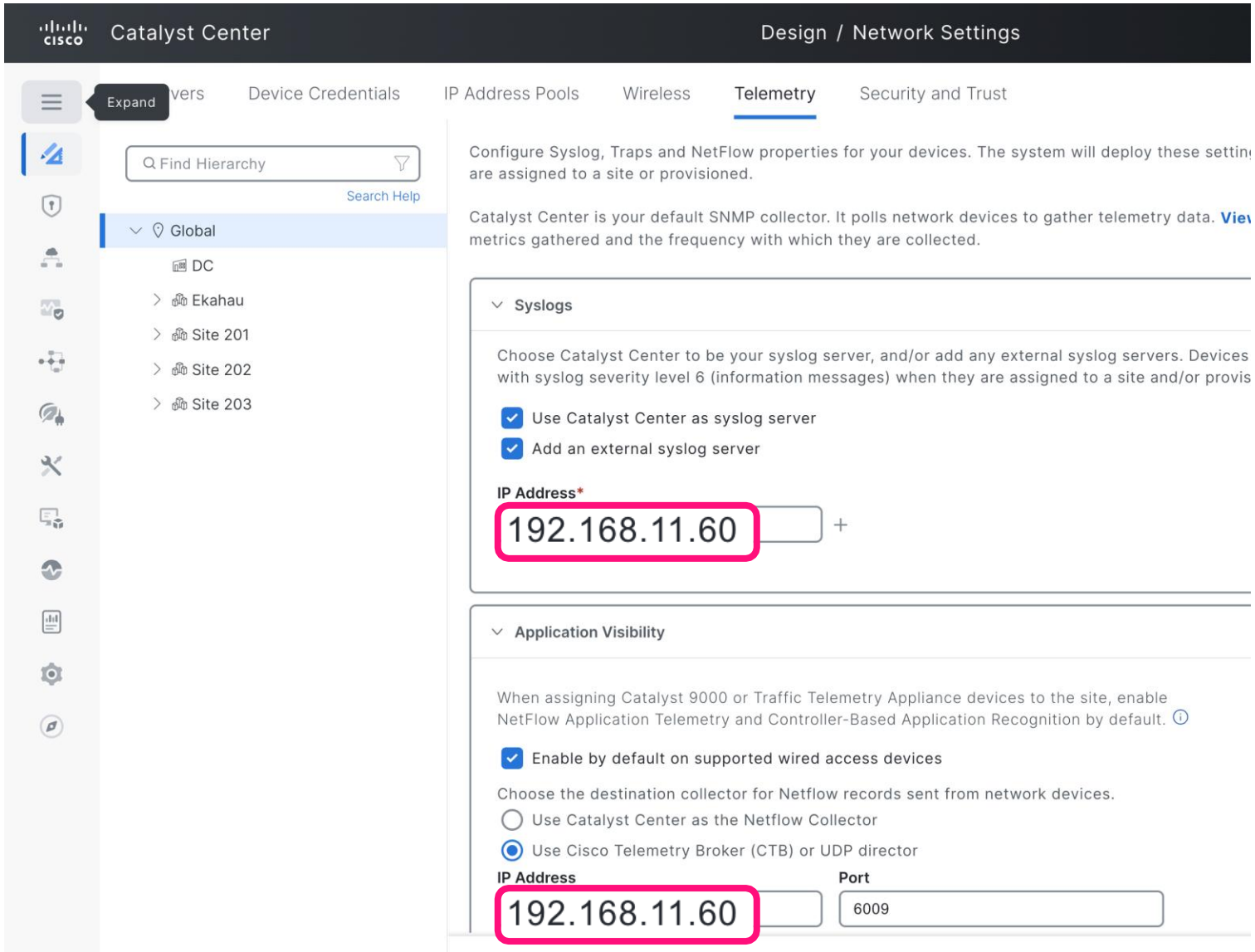
Account Name	Username	Hostname
splunk77	splunk	https://10.67.27.77
splunk79	splunk	https://10.67.27.79

Step 1 – Add Catalyst Center(s) user account

Step 2 – Add Inputs



Getting Catalyst Center Telemetry Sent to Splunk



Syslog

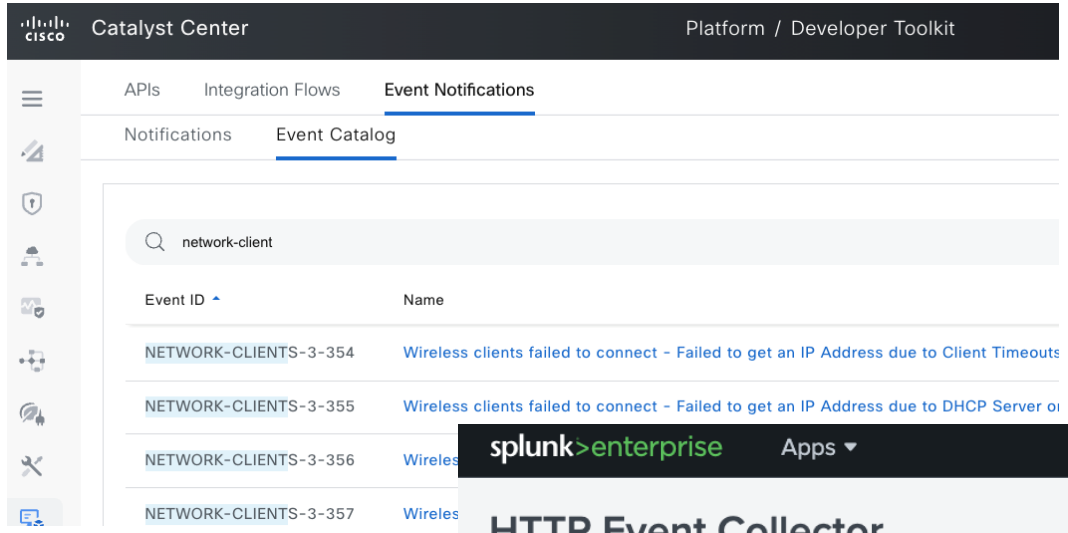
- Add an entry for syslog with Splunk as the destination

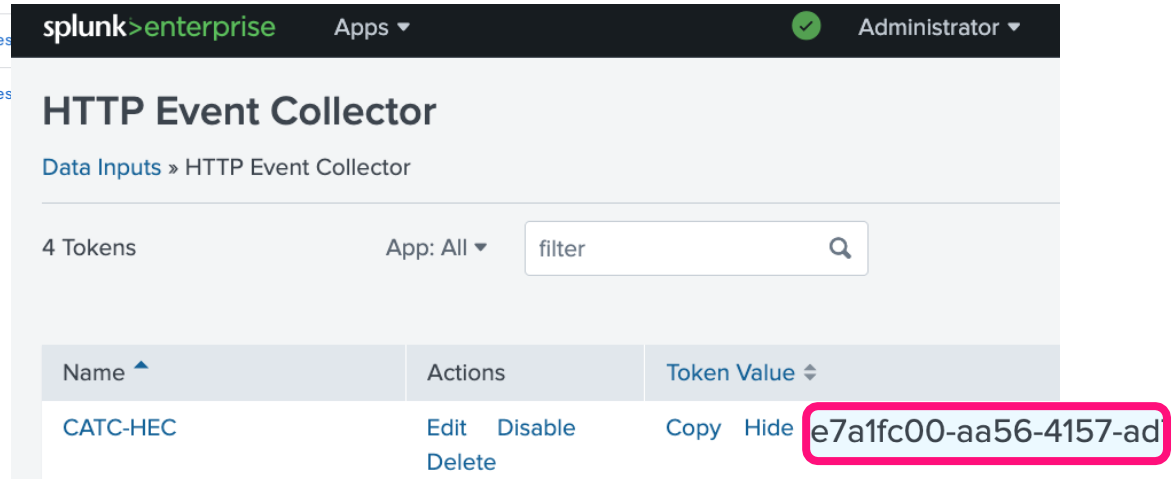
Application Visibility

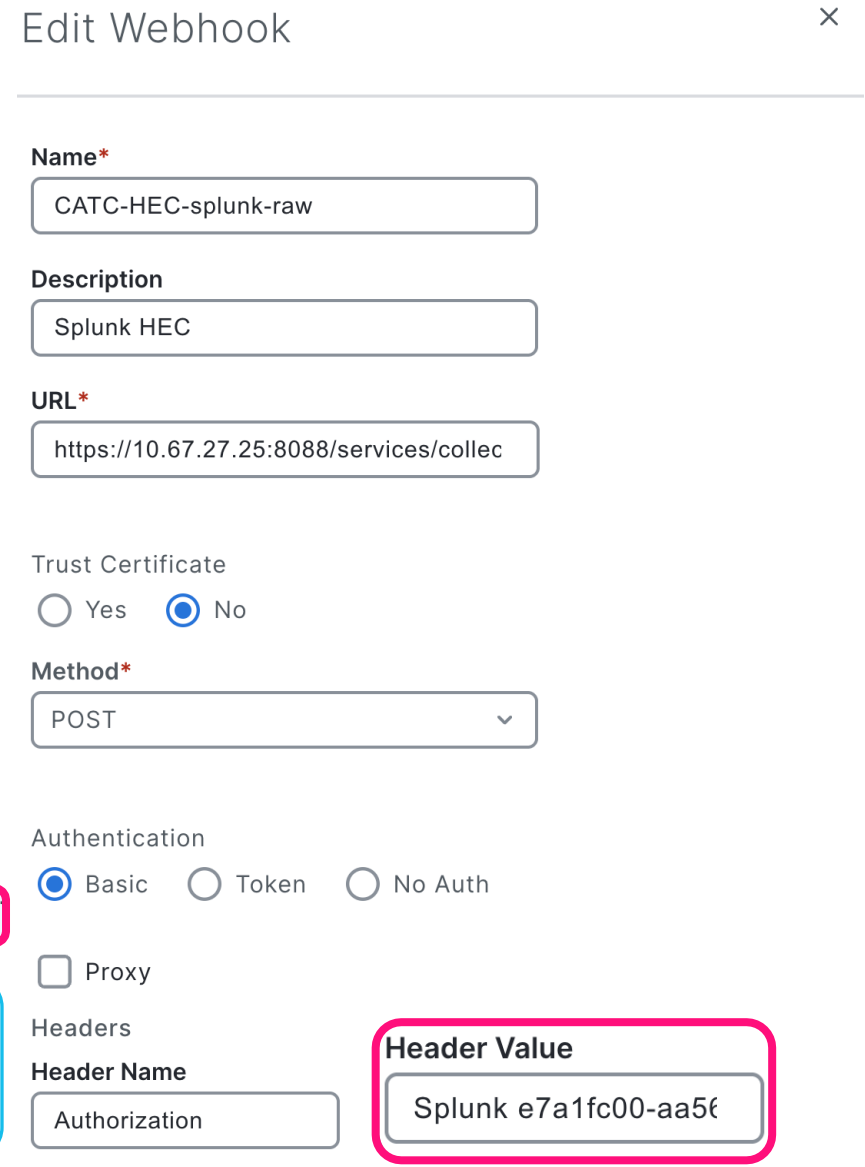
- Use a Telemetry Broker (shown) or add a NetFlow exporter using Catalyst Center Templates

Catalyst Center Event Notifications – Webhook

Send events and notifications from Catalyst Center directly to Splunk







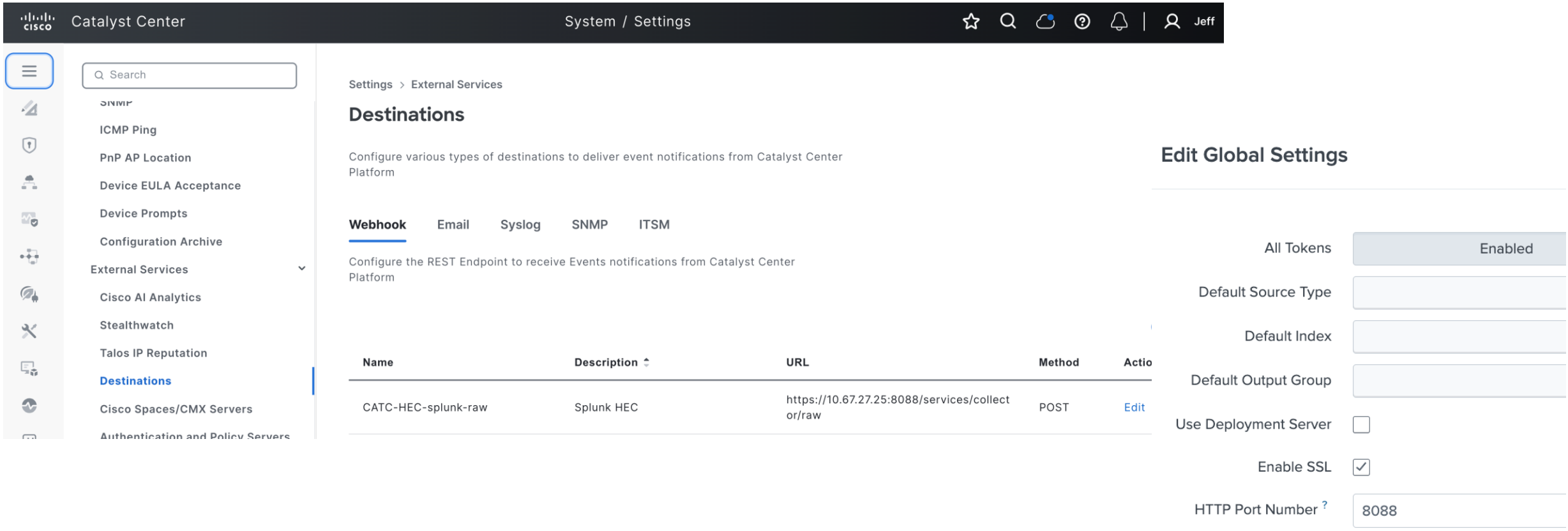
Step 1 – Create a destination webhook in Catalyst Center Settings → External Services

- Header Value must contain the text Splunk, followed by the Splunk HEC token

cisco

Catalyst Center Event Notifications – Webhook

Send events and notifications from Catalyst Center directly to Splunk



Step 1 (cont)– Create a destination webhook in Catalyst Center Settings → External Services

- URL is the Splunk HEC listener on https://<splunk-svr>:8088/services/collector/raw

Catalyst Center Event Notifications – Webhook

Step 3 - REST Settings

Configure the REST channel settings for this notification

Select a REST Webhook setting. Or Click here to create a new

Select Instance

CATC-HEC-splunk-raw

URL

https://10.67.27.25:8088/services/collector/raw

Trust Certificate

Yes No

Method

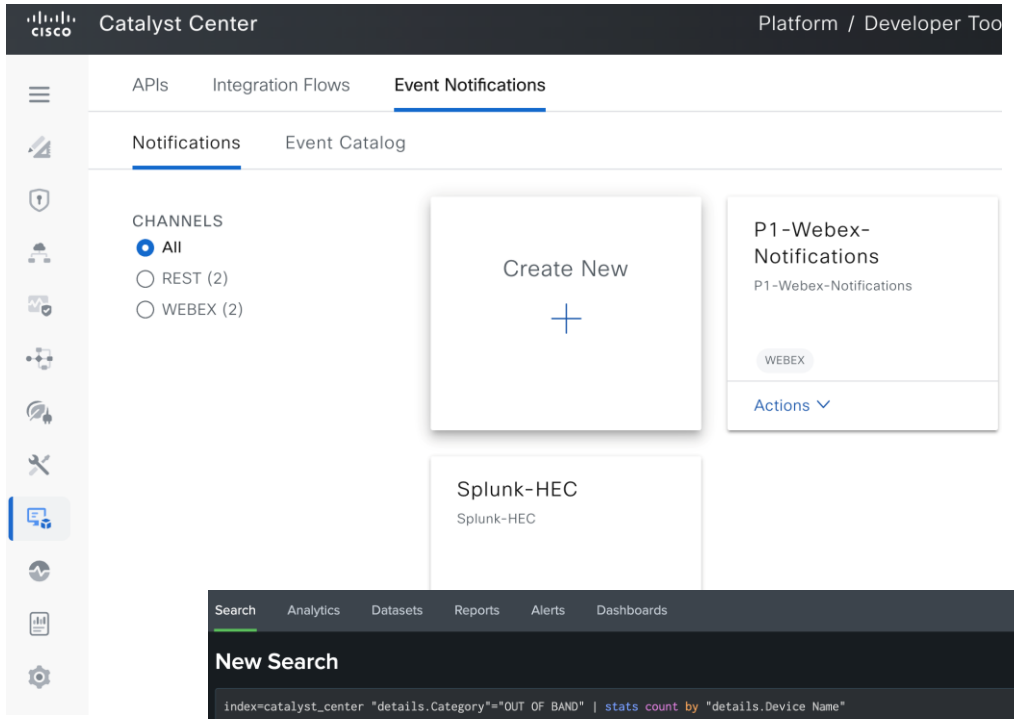
POST

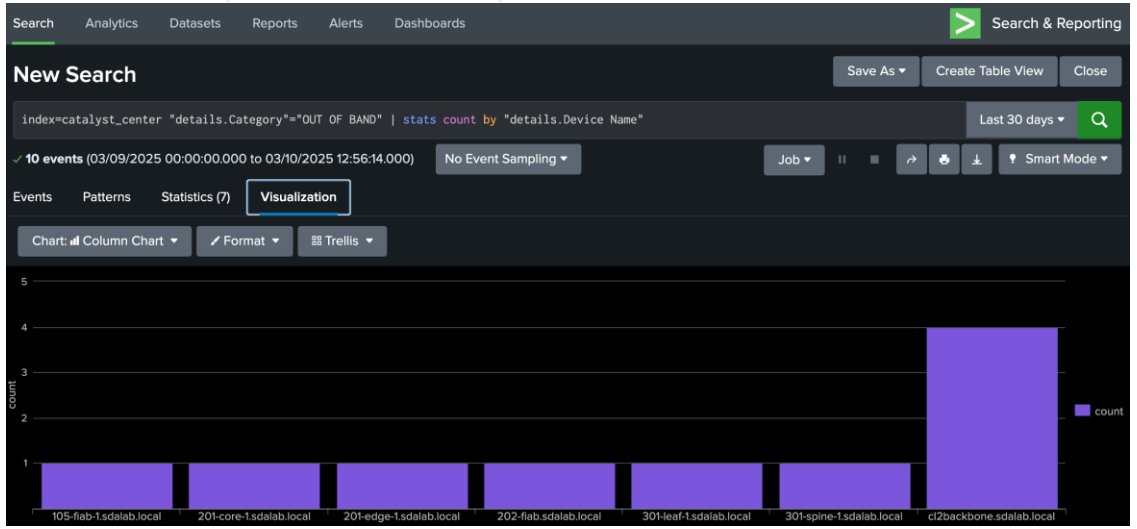
Authentication

Basic Token No Auth

Headers

Header Key	Header Value
Authorization	Splunk e7a1fc00-aa56-4157-ad



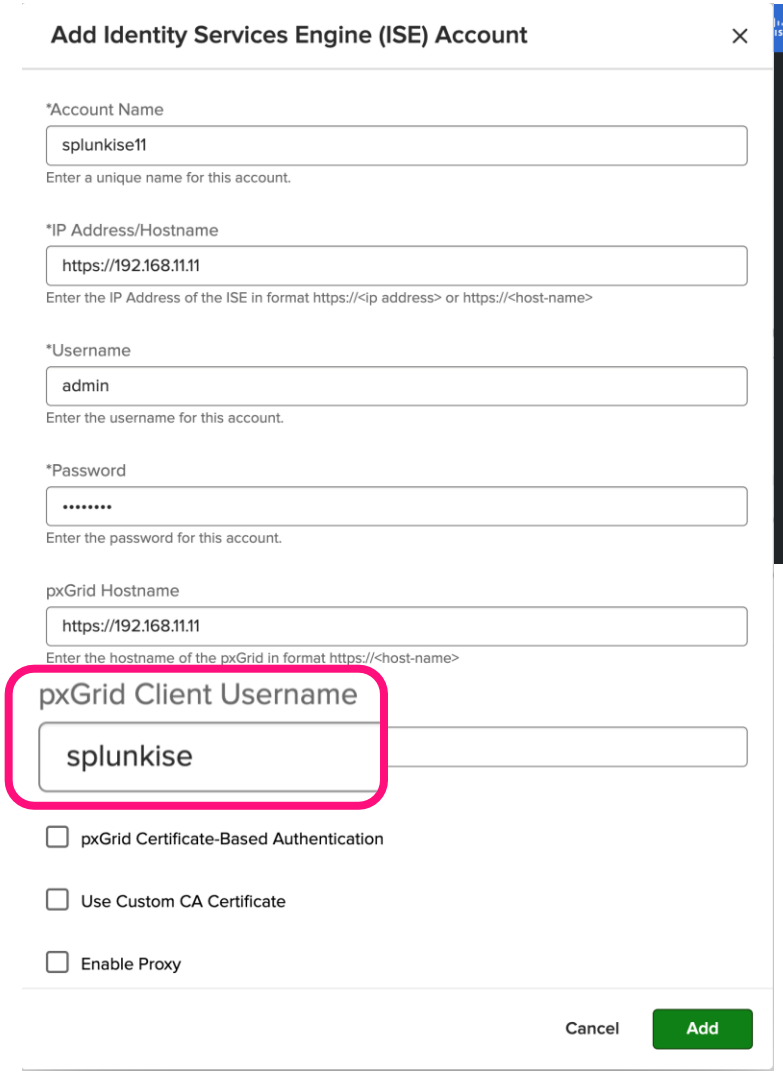


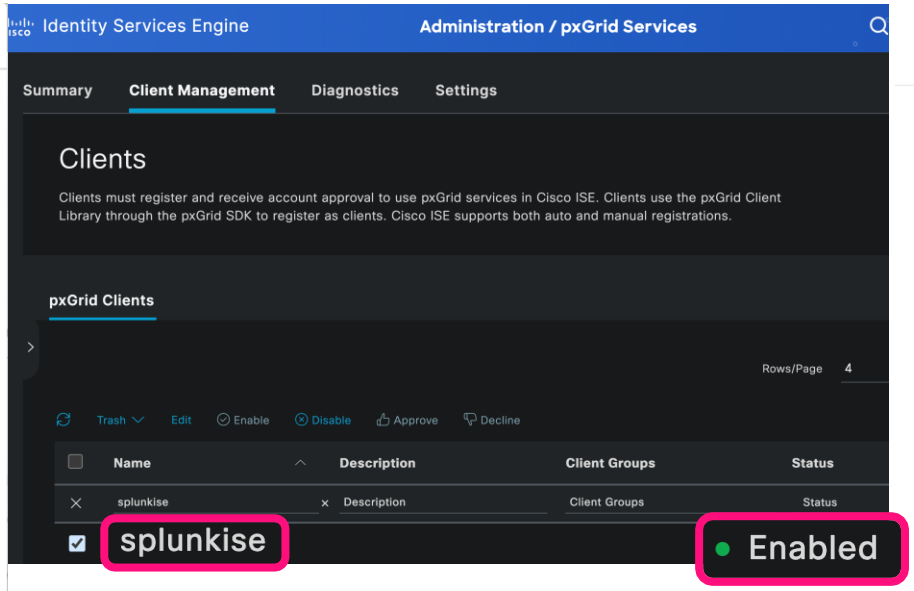
Step 2 – Subscribe to Events in Catalyst Center Platform → Developer Toolkit → Event Notifications

Identity Services Engine

Catalyst App – Identity Services Engine

Send Identity Services Engine Data to Splunk



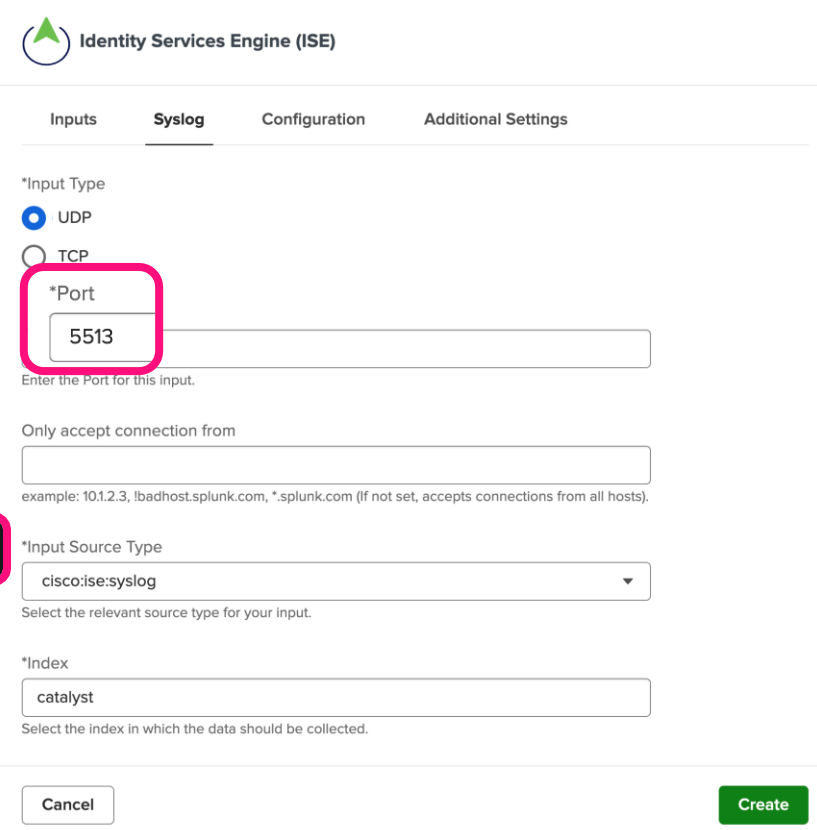


Step 1 – Add ISE user account

- Creates a pxGrid client on ISE
- Enable pxGrid client on ISE

Step 2 – Add Syslog

- Creates a listener port on Splunk automatically



Catalyst App – Identity Services Engine Inputs

Send Identity Services Engine Data to Splunk

Identity Services Engine (ISE)

Inputs | Syslog | Configuration | Additional Settings

*Name
splunkISE
Enter a unique name for the data input.

*Interval
300
Time interval of input in seconds. Minimum value is 60.

*Index
catalyst

*Cisco ISE Account
splunkise11

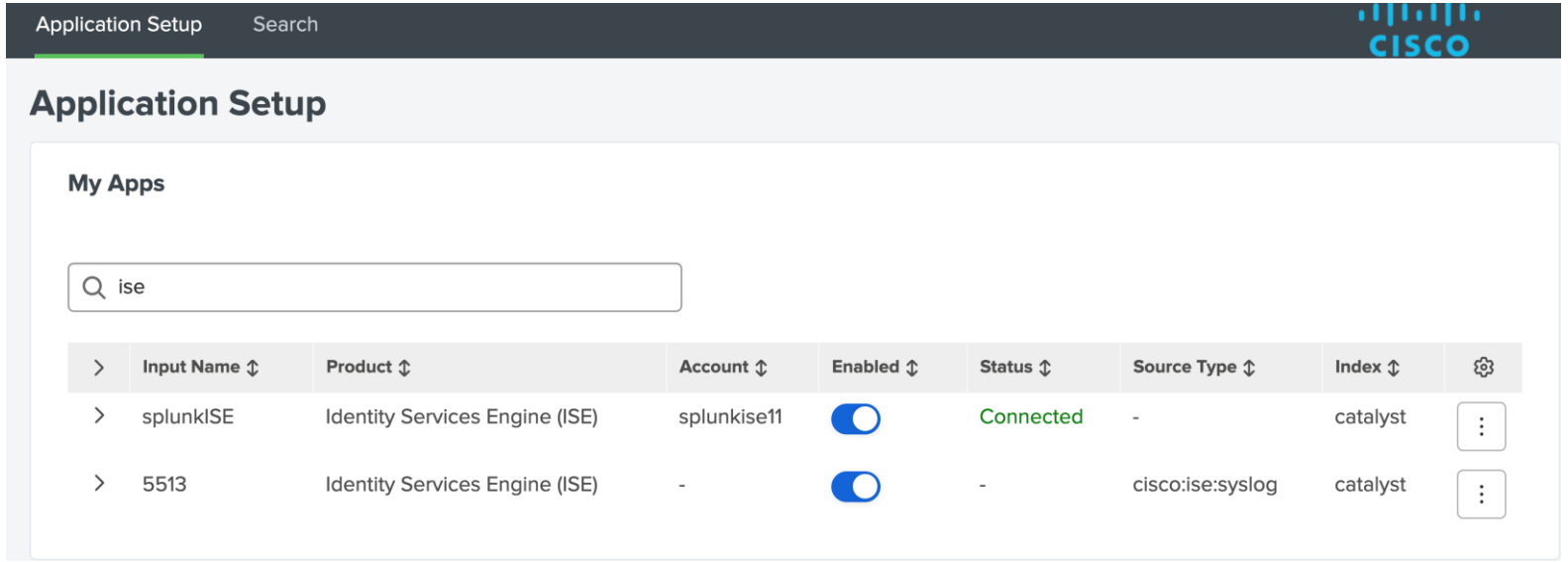
*Fetch Cisco ISE Environment Data
Security Group Tags | Authz Policy Hit | ISE TACACS Rule Hit

IP-SGT Bindings
Configure the settings in the Additional Settings Tab if you want to fetch the Security Group Tags from Cisco ISE server.

*Logging Level
INFO
Logging level for messages written to input logs in $SPLUNK_HOME/var/log/splunk/TA_cisco_catalyst/

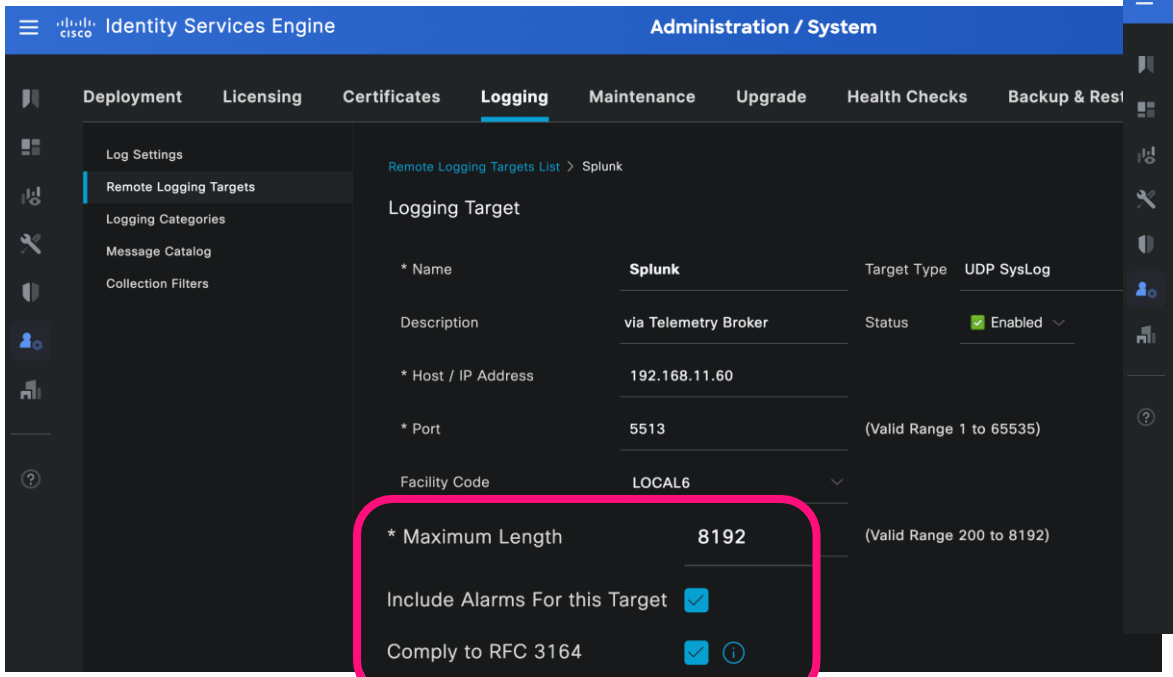
Cancel | Create

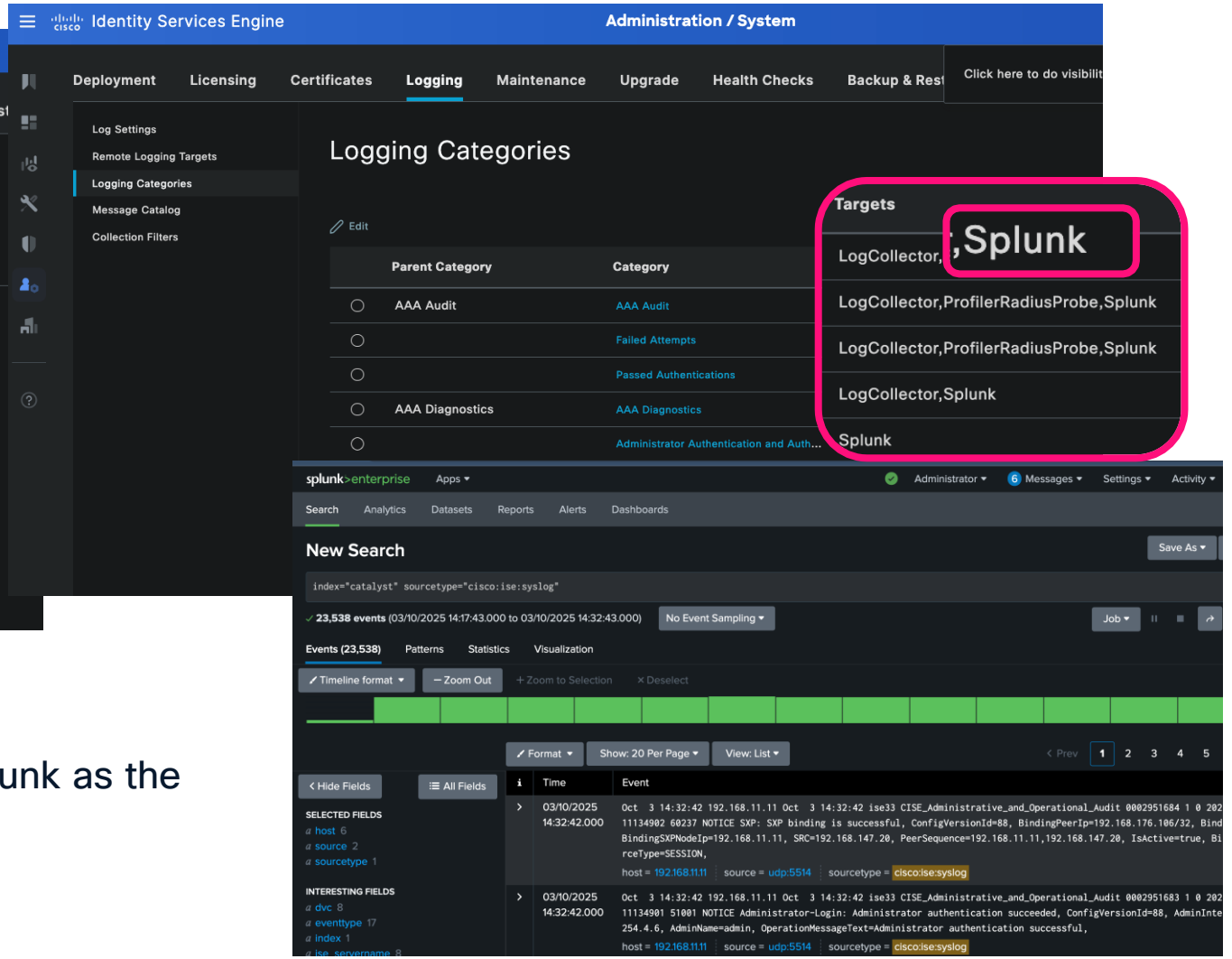
Step 3 – Add ISE inputs



Identity Services Engine Logging to Splunk

Remote Targets and Logging Categories





Remote Logging Target

- Configure an ISE Remote Logging Target using Splunk as the destination

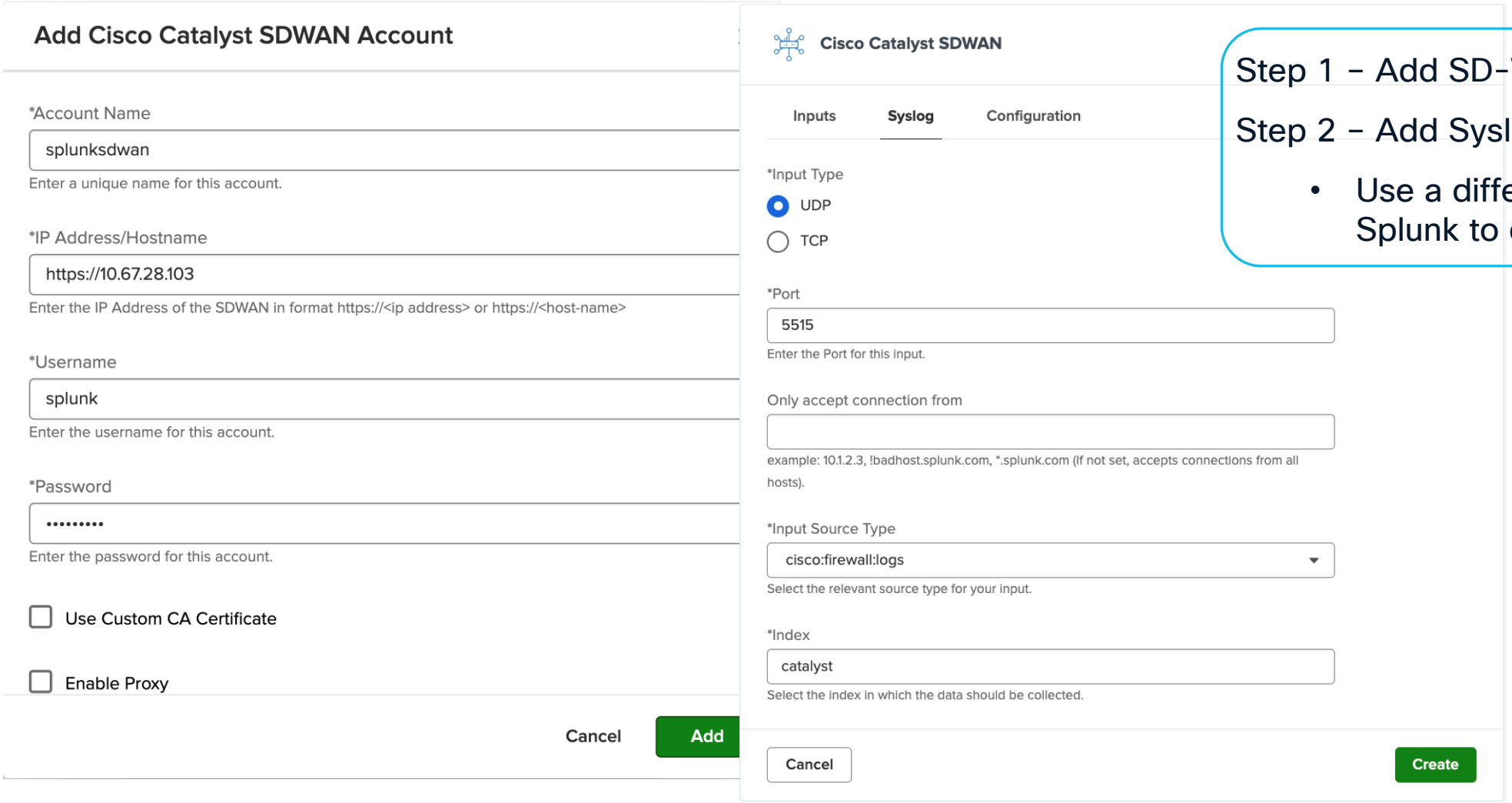
Logging Category

- Add Splunk Remote Logging Target to Logging Categories

SD-WAN

Catalyst App – SD-WAN

Send SD-WAN Data to Splunk



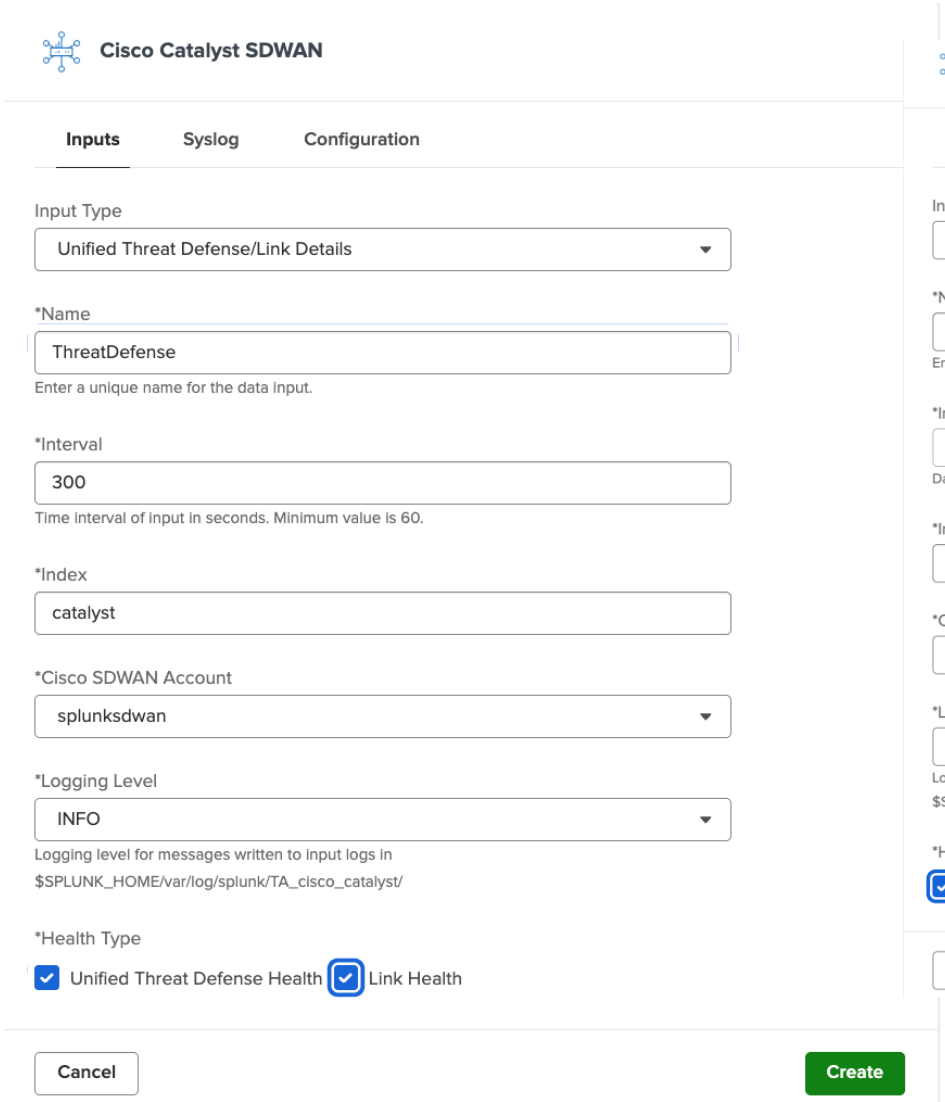
Step 1 – Add SD-WAN user account

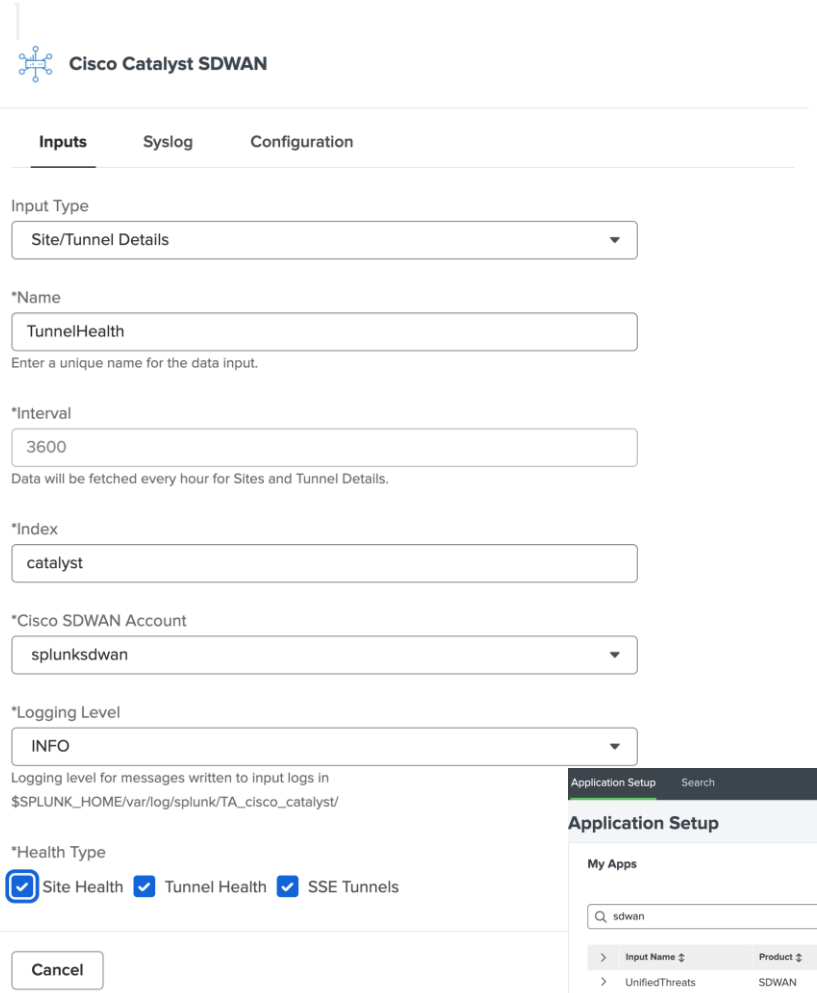
Step 2 – Add Syslog

- Use a different listener port on Splunk to easily search data

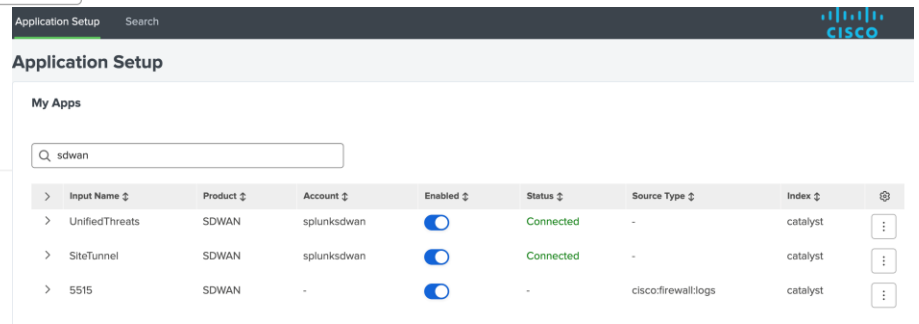
Catalyst App – SD-WAN

Send SD-WAN Data to Splunk



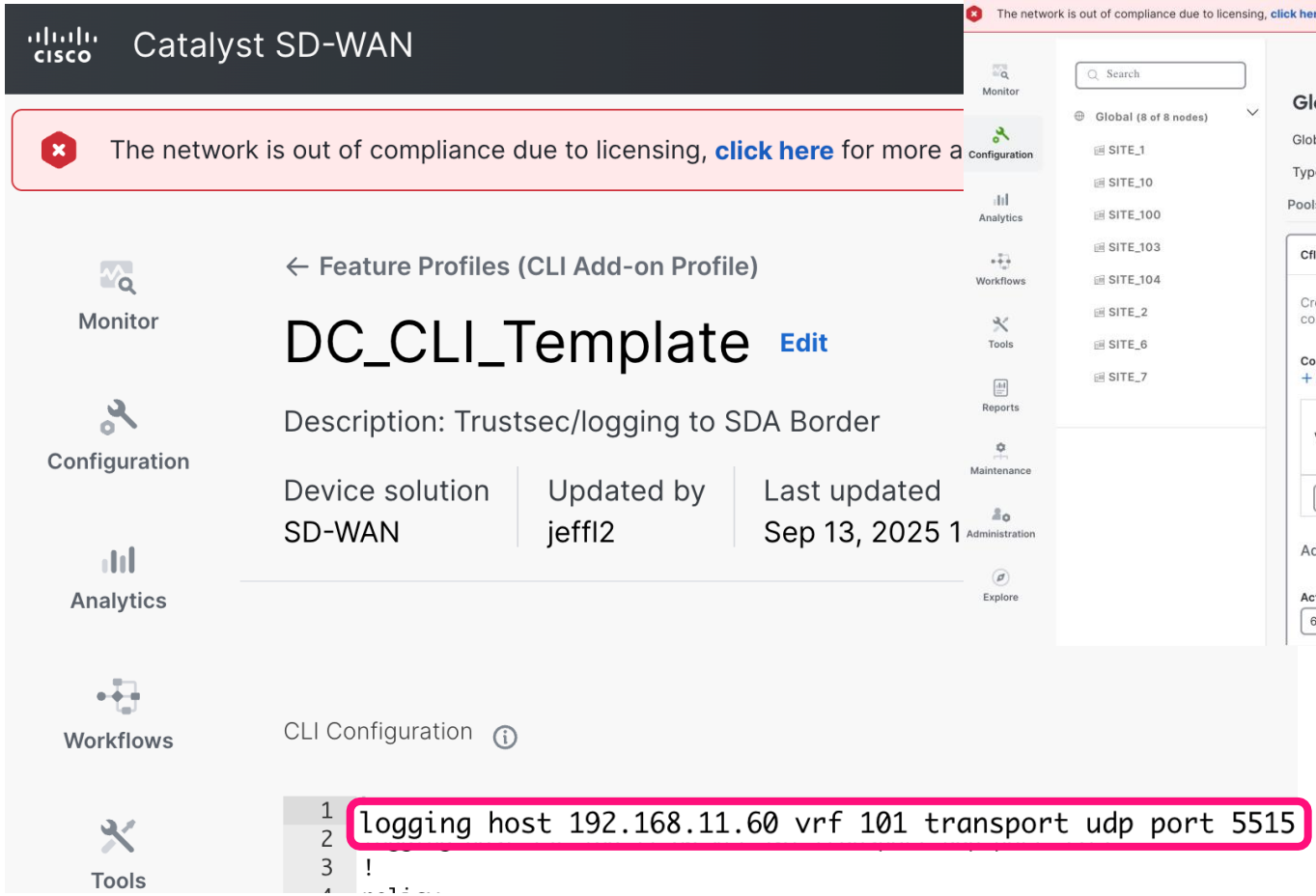


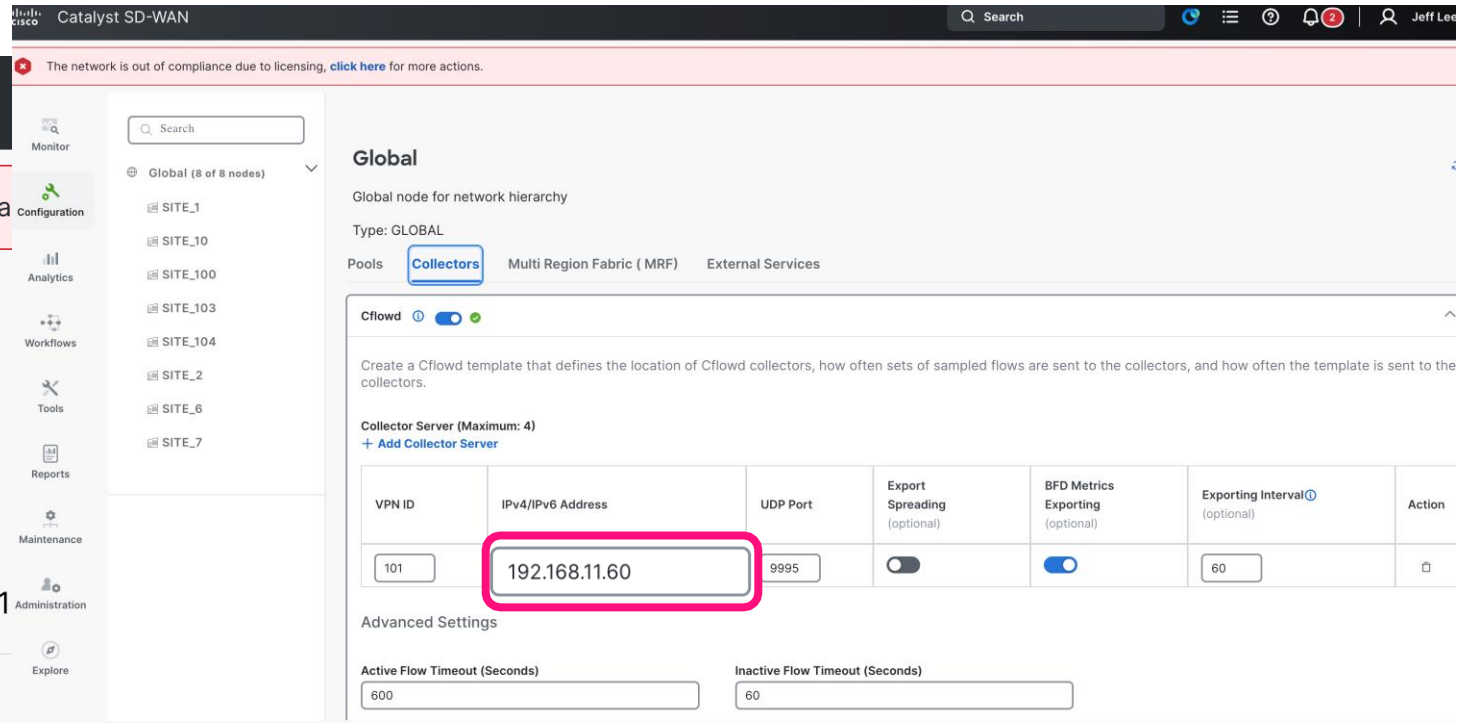
Step 3 – Add SD-WAN inputs



SD-WAN Logging to Splunk

Custom syslog port and NetFlow for Splunk





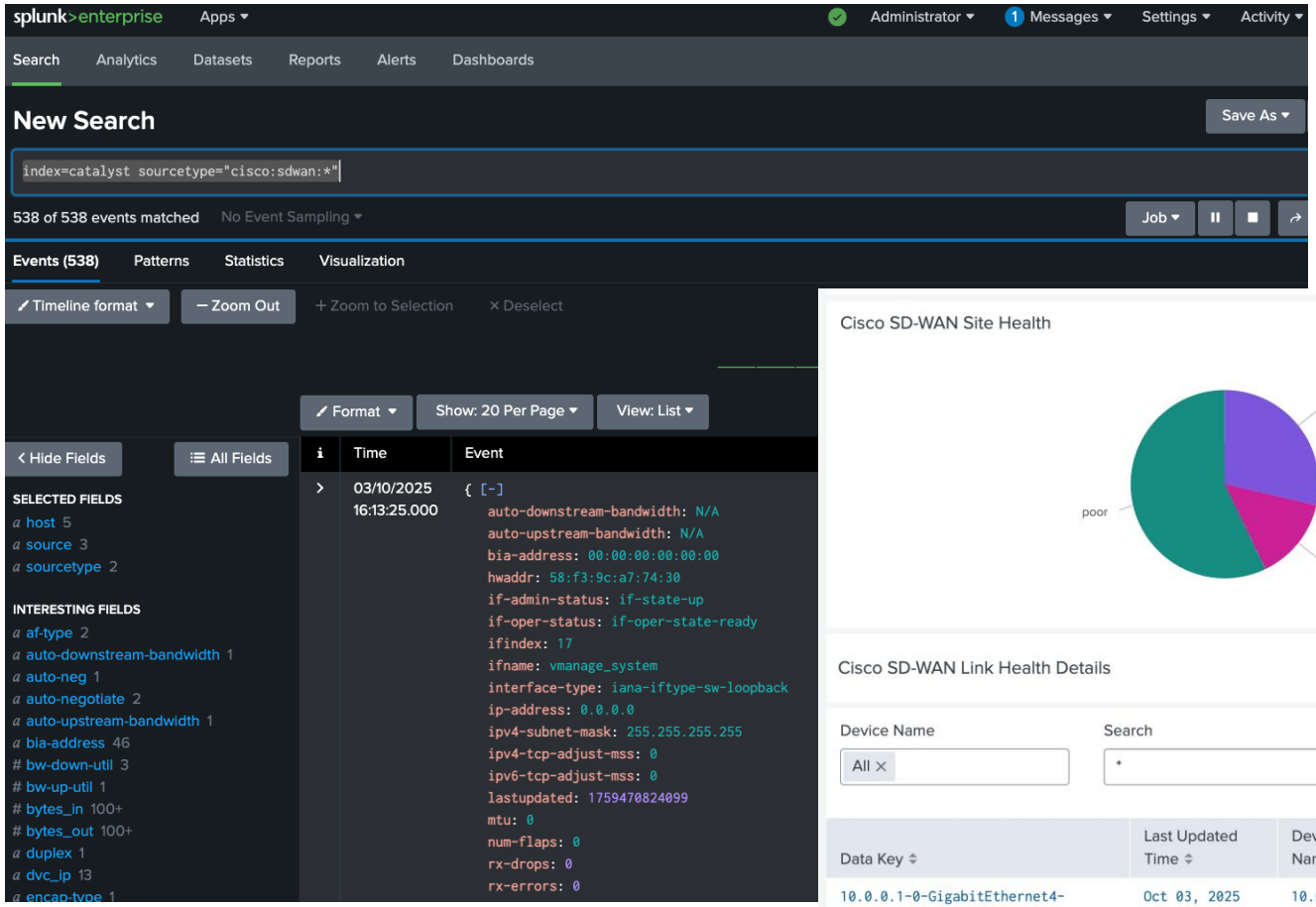
Syslog

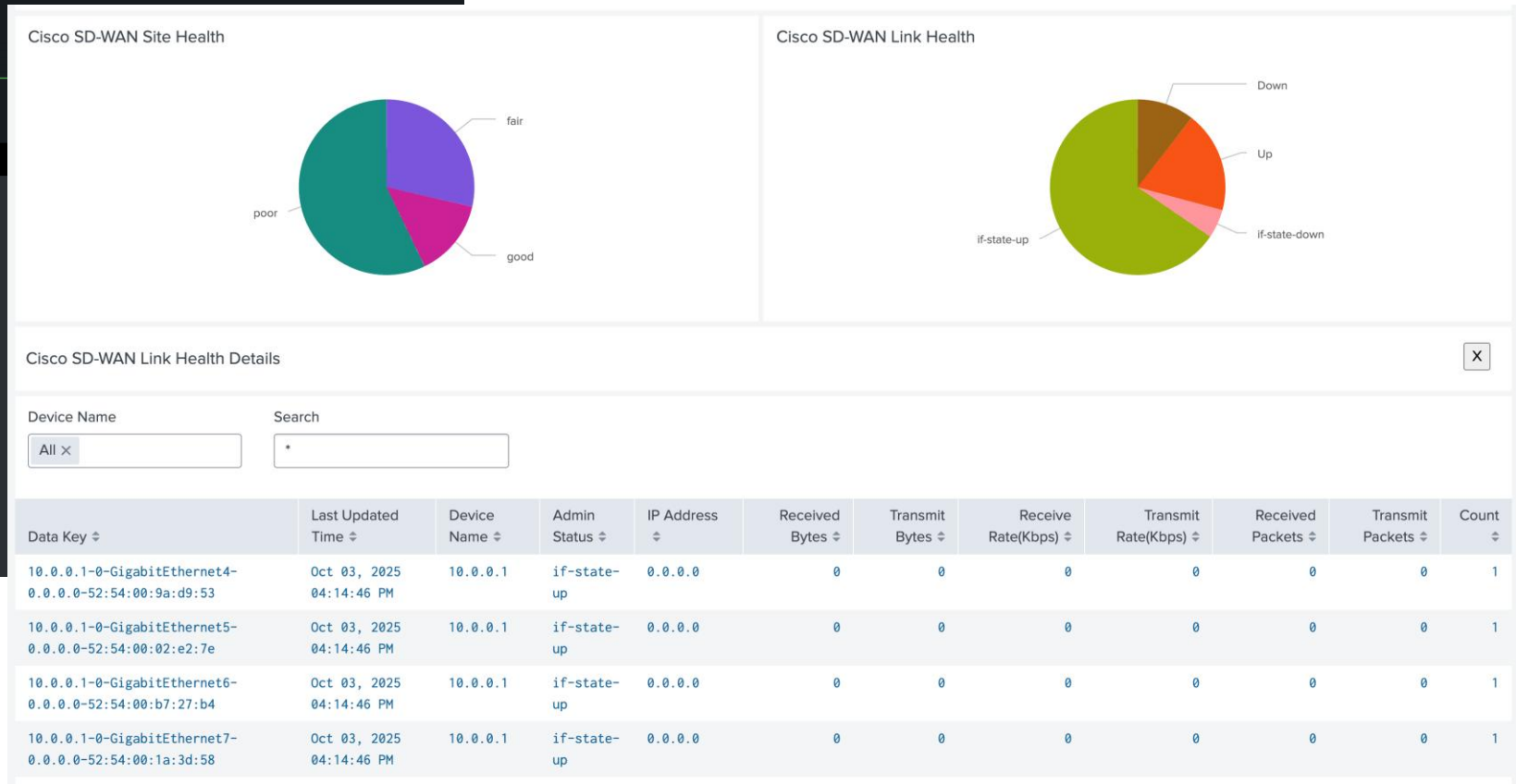
- CLI-Add-on profile specifying custom syslog for Splunk

NetFlow

- Add Cflowd collector address as Splunk

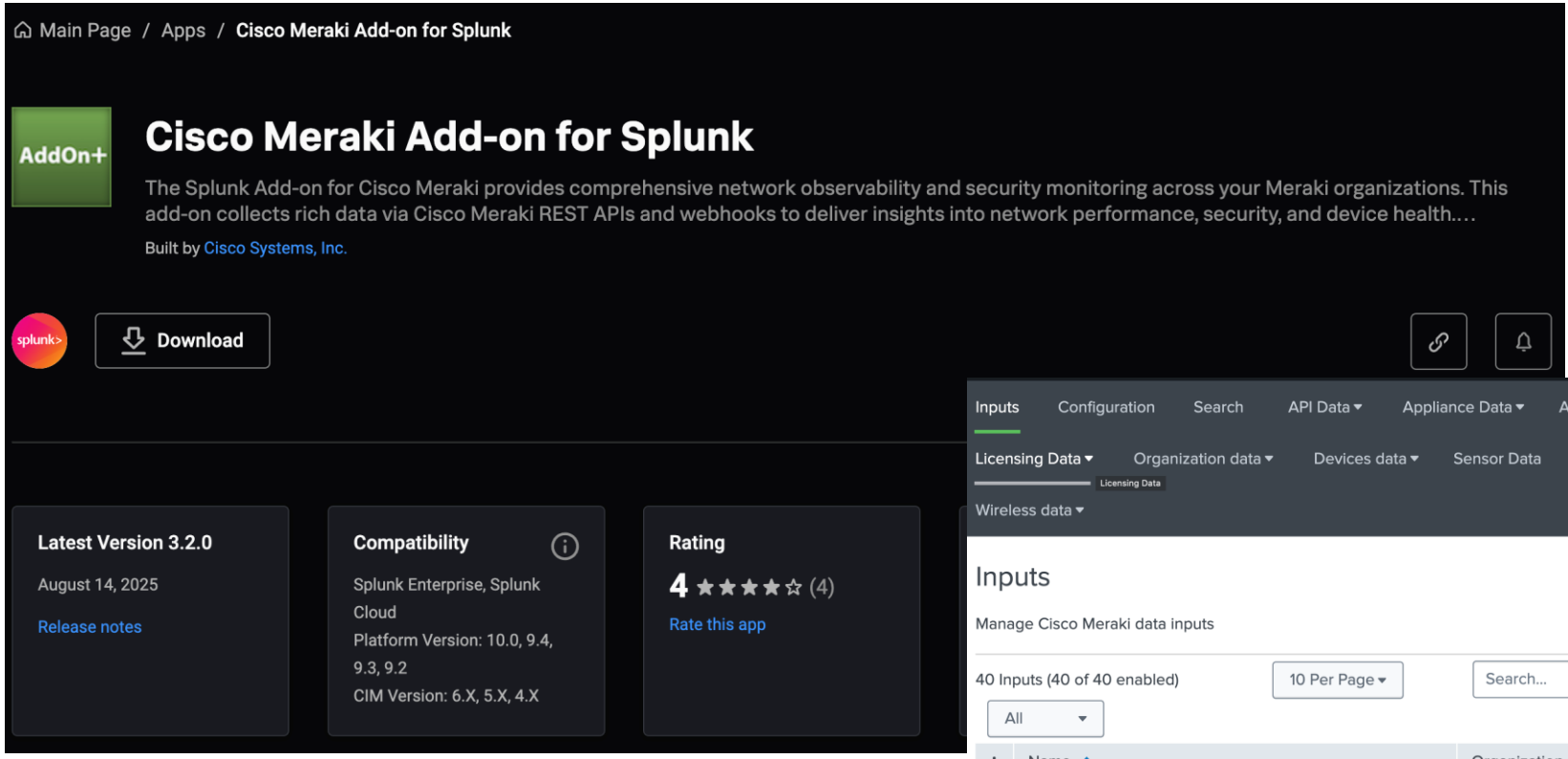
Enterprise Networking App – SD-WAN Dashboards

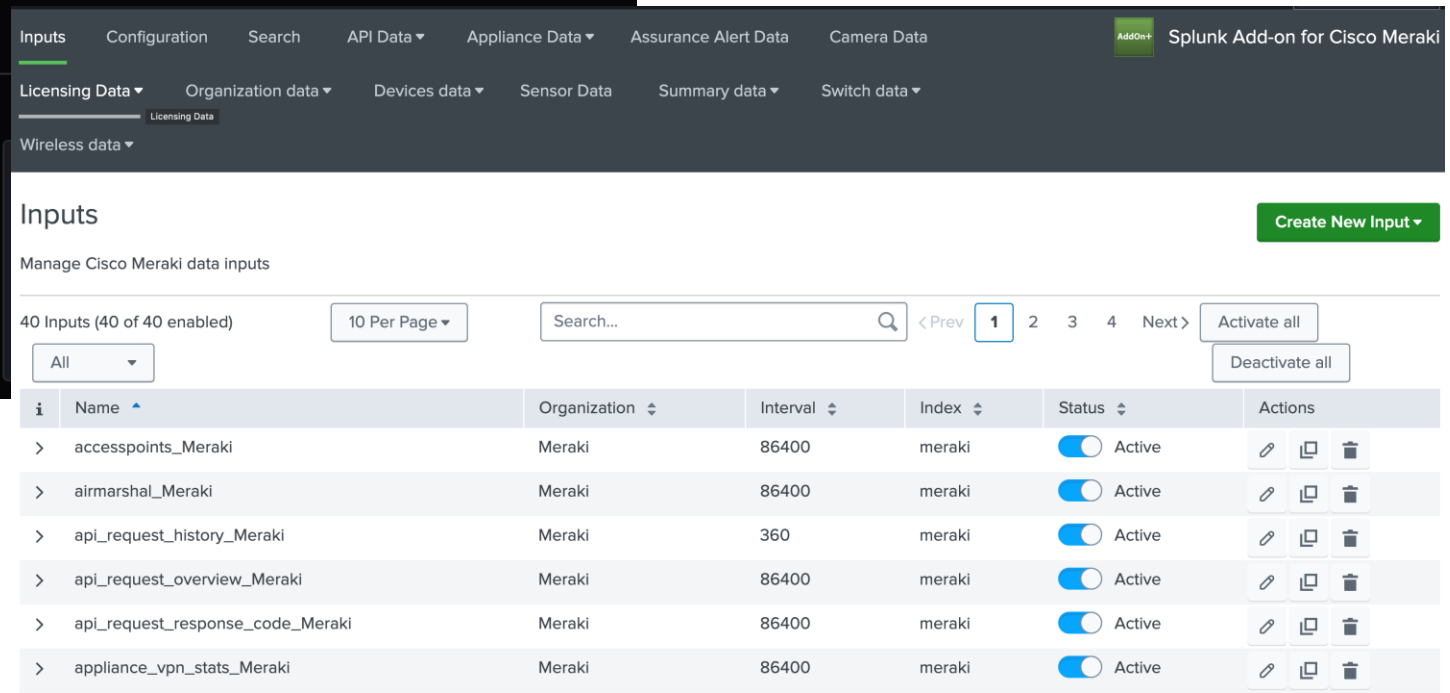




Meraki Add-On

Meraki Add-On for Splunk

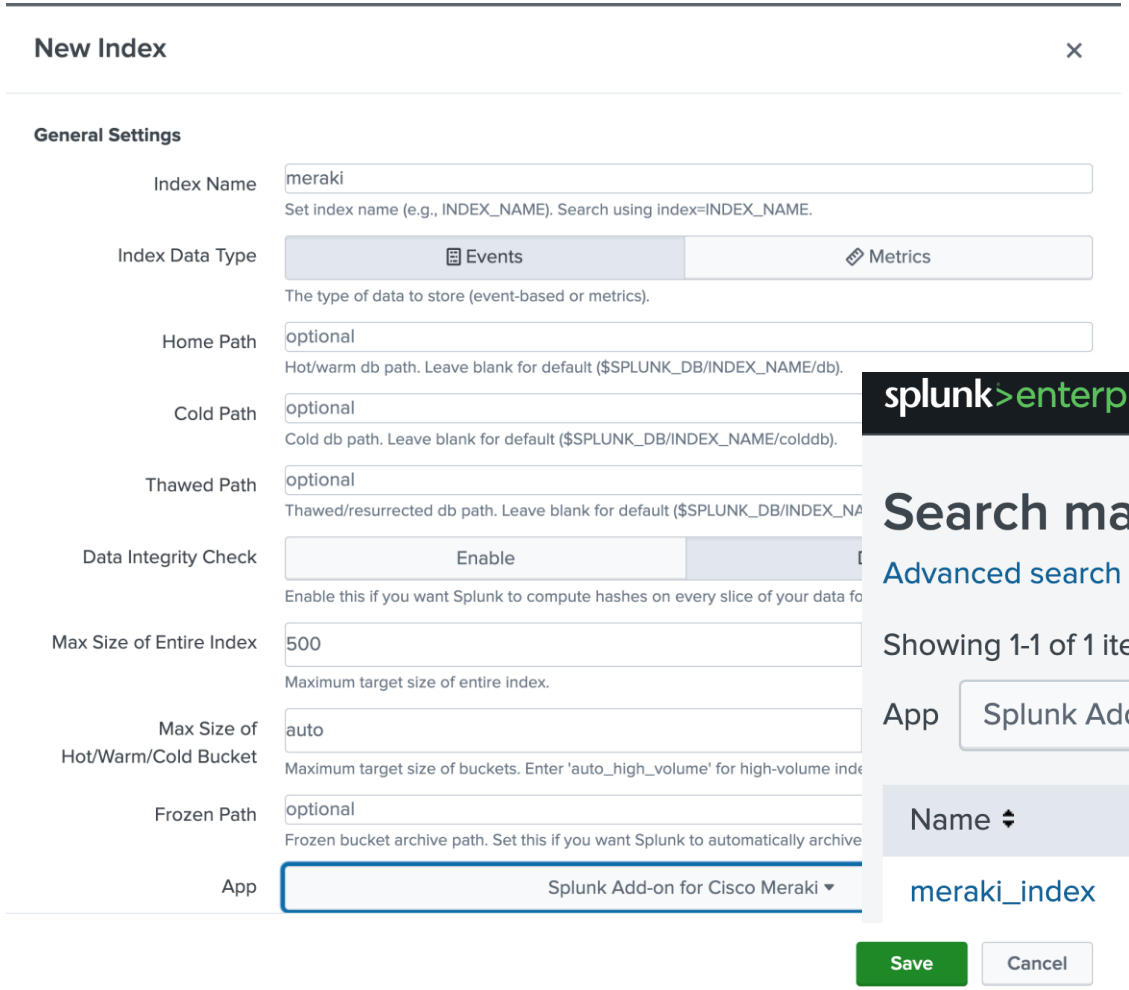




https://splunkbase.splunk.com/app/5580

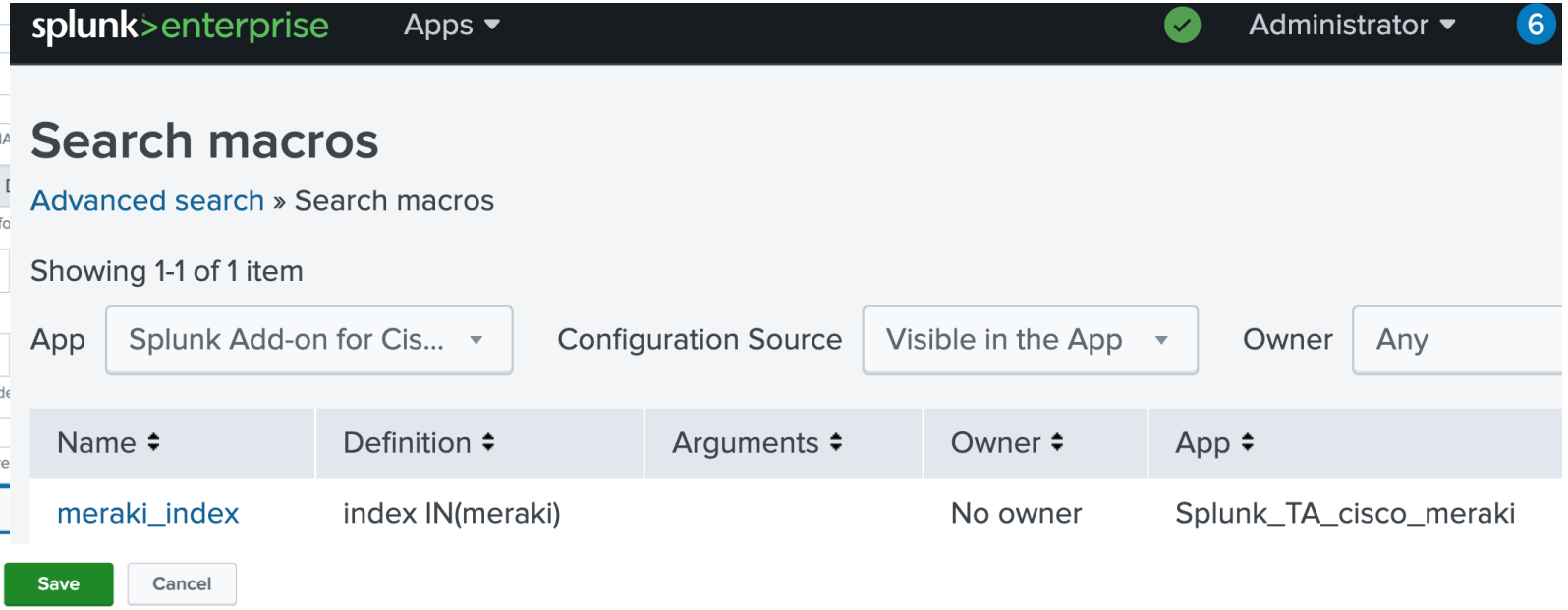
Meraki Add-On for Splunk – Indexes and Search Macro

Add dedicated Maraki index



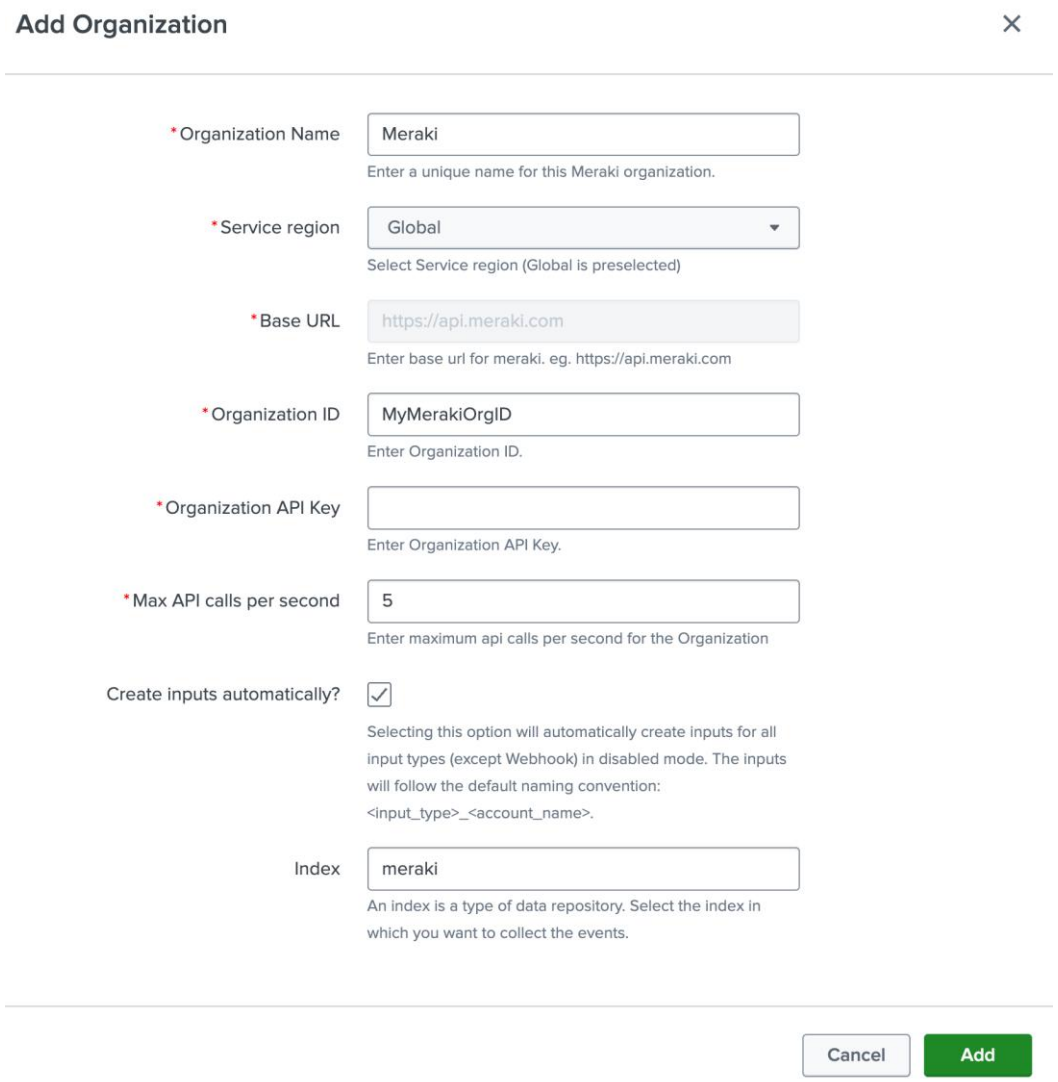
Step 1 – Create Meraki index

Step 2 – Adjust the search macro to use the new index



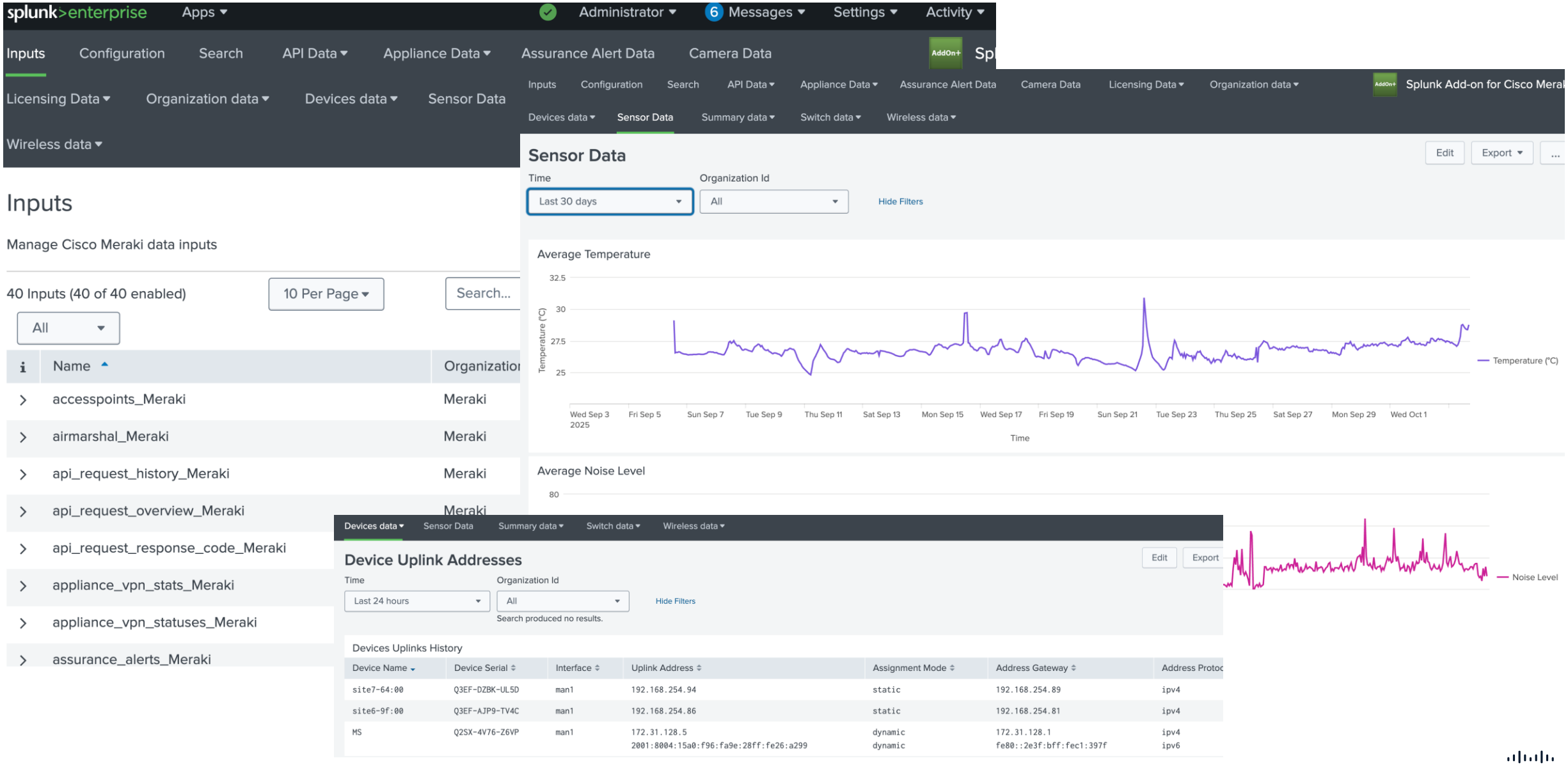
Meraki Add-On for Splunk – Add Organization

Add Meraki credential information

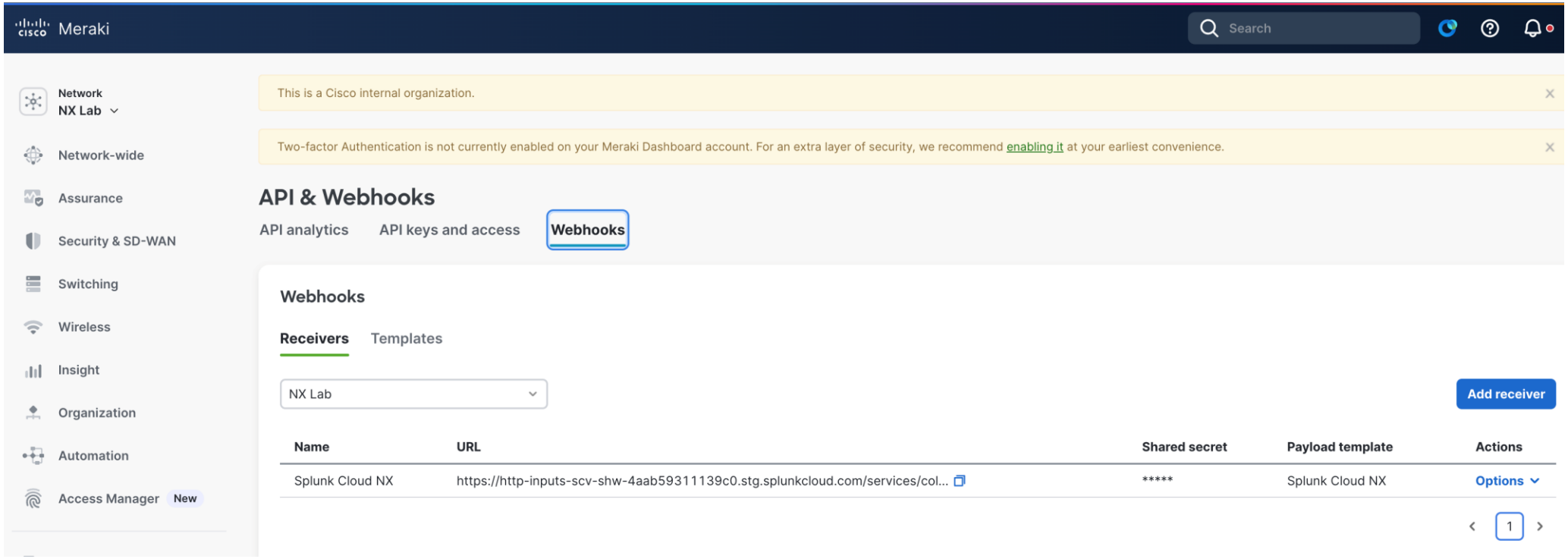


Step 3 – Add Meraki Organization ID and API key

Meraki Add-On for Splunk – Add Inputs



Meraki Add-On for Splunk – Webhooks

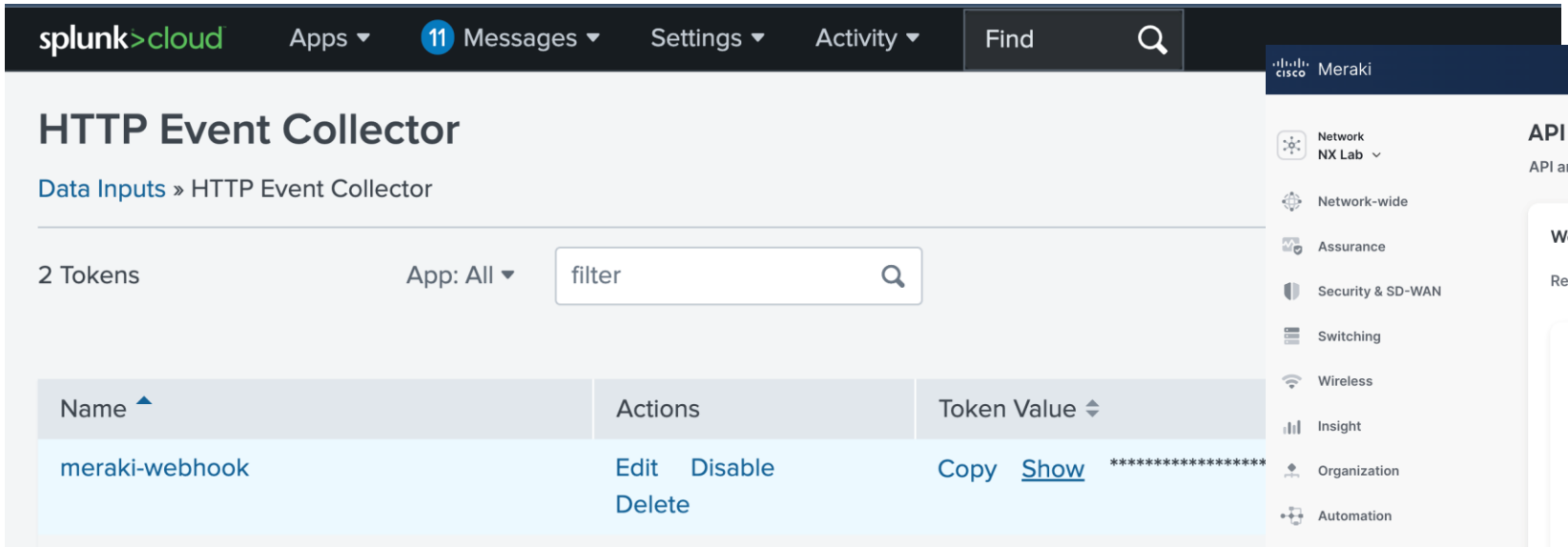


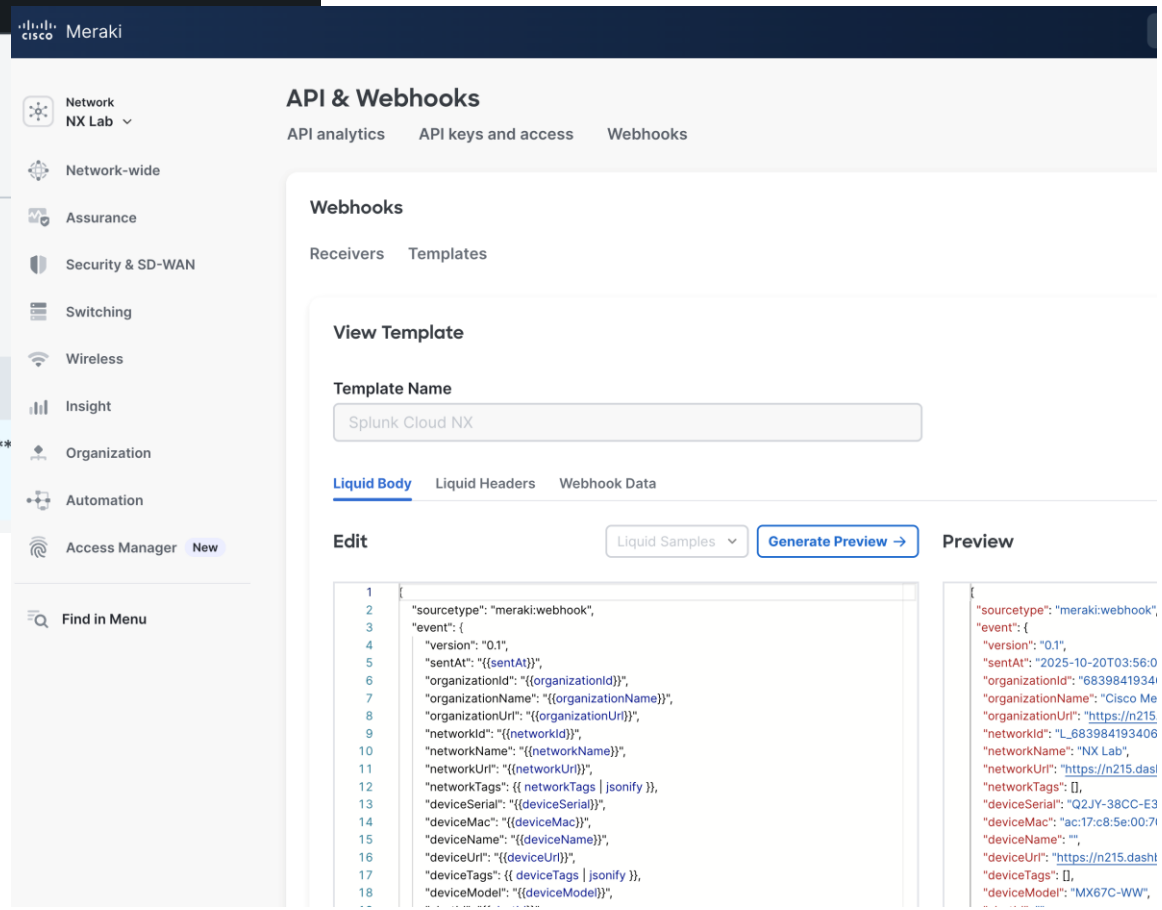
Webhooks

- Subscribe to network alerts from Meraki Dashboard and send directly to Splunk for indexing
- Allows for real-time monitoring
- Format is in JSON format

Meraki Add-On for Splunk – Webhooks

Create Splunk HEC and Meraki liquid body webhook template





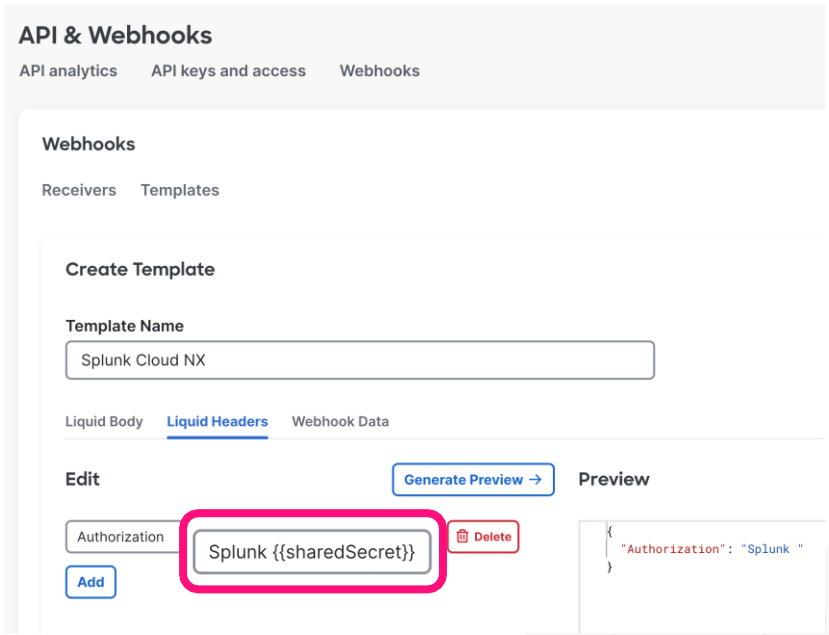
Step 1 – HTTP Event Collector for Meraki webhooks

Step 2 – Create a Meraki liquid body template that is used to format the alert sent to Splunk

https://github.com/meraki/webhook-payload-templates/tree/main/splunk

Meraki Add-On for Splunk – Webhooks

Create a liquid header webhook template



Step 3 – Create a liquid header template

- The Header Value must contain the text **Splunk {{sharedSecret}}**

Step 4 – Add the webhook receiver

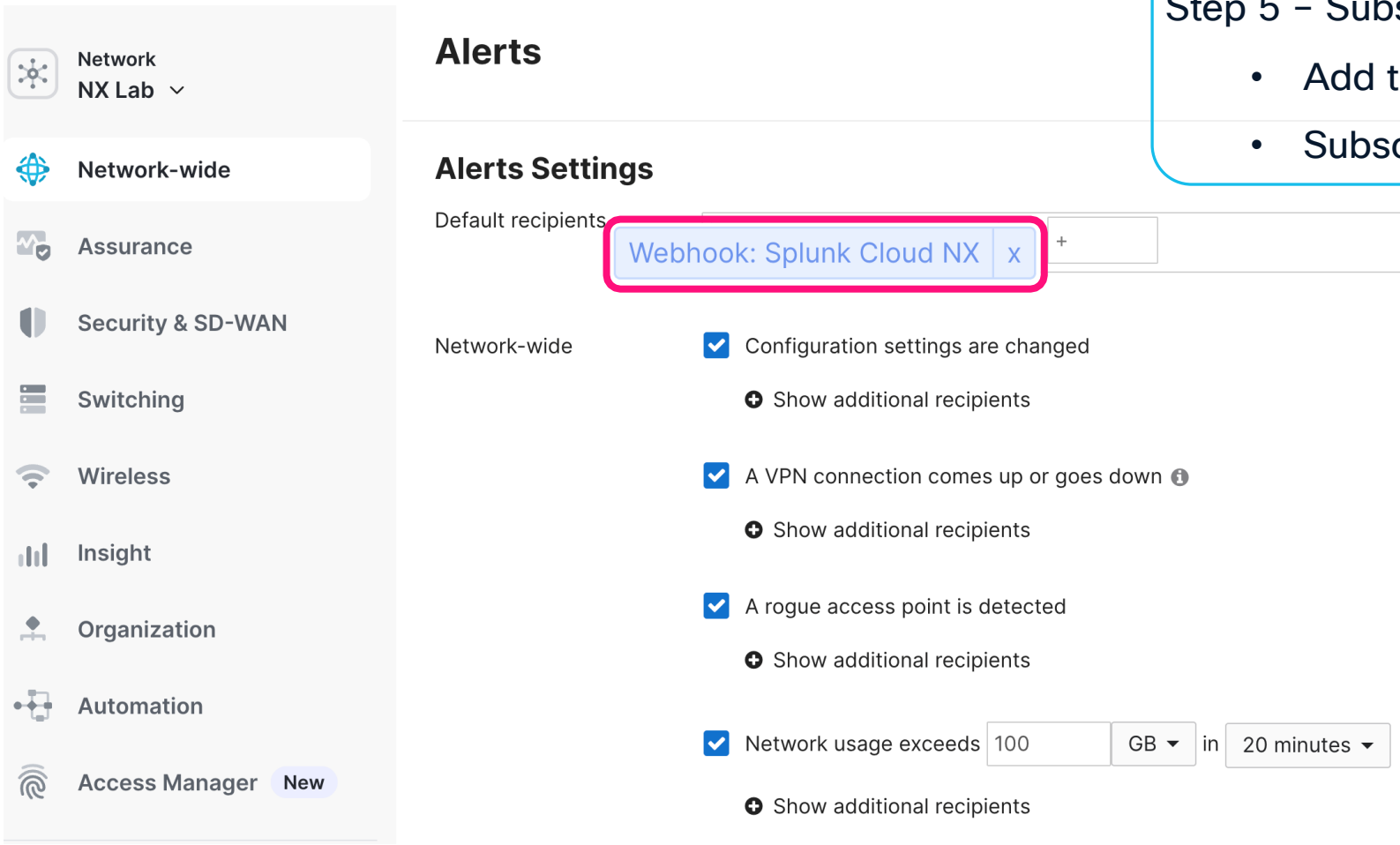
- Specify the Splunk **HEC token** as the shared secret
- Splunk Cloud **URL** – https://http-inputs.<splunkcloudinstance>/services/collector/event

Meraki Add-On for Splunk – Webhooks

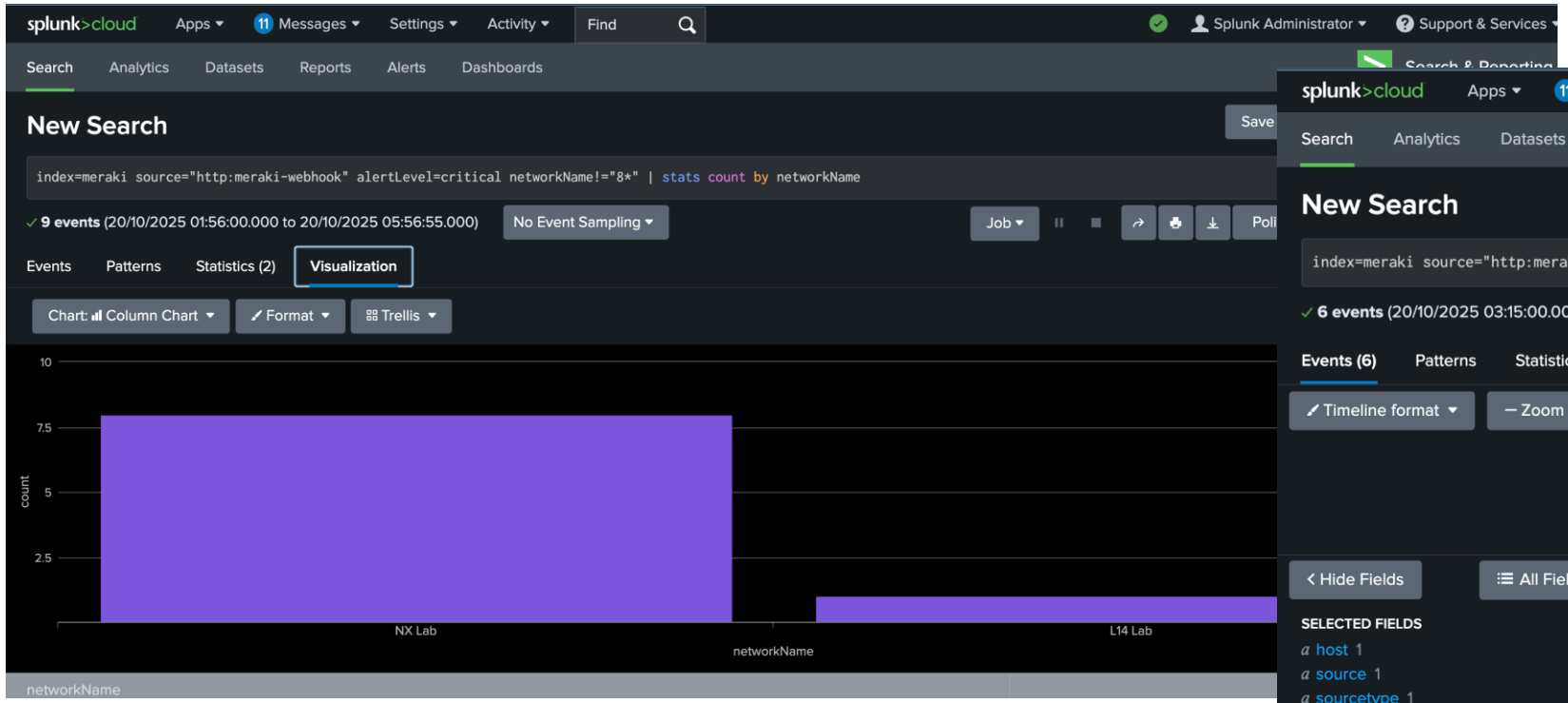
Create a liquid header webhook template

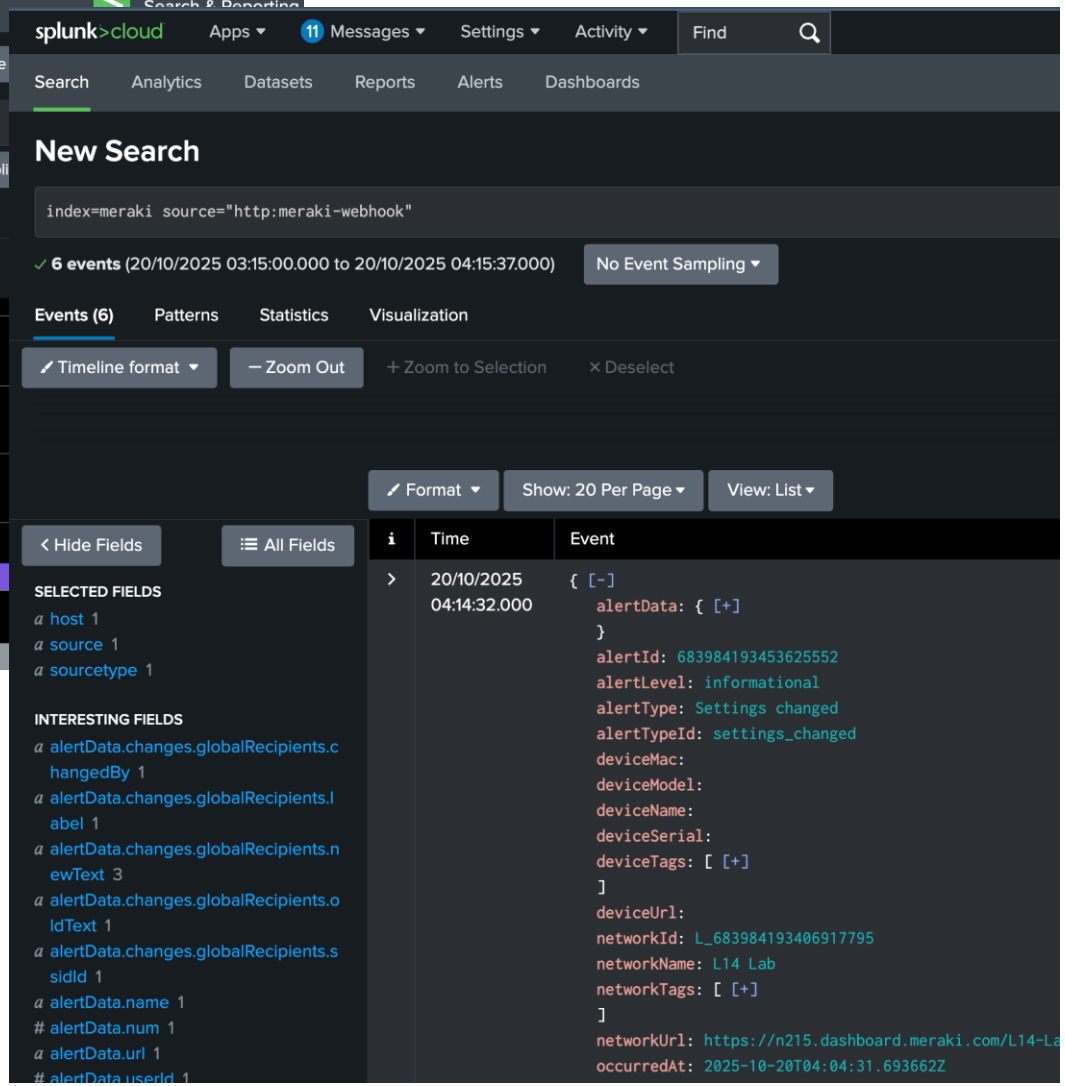
Step 5 – Subscribe to Network-wide Alerts

- Add the recipient as the webhook for the alert
- Subscribe to alerts



Meraki Webhook Searching



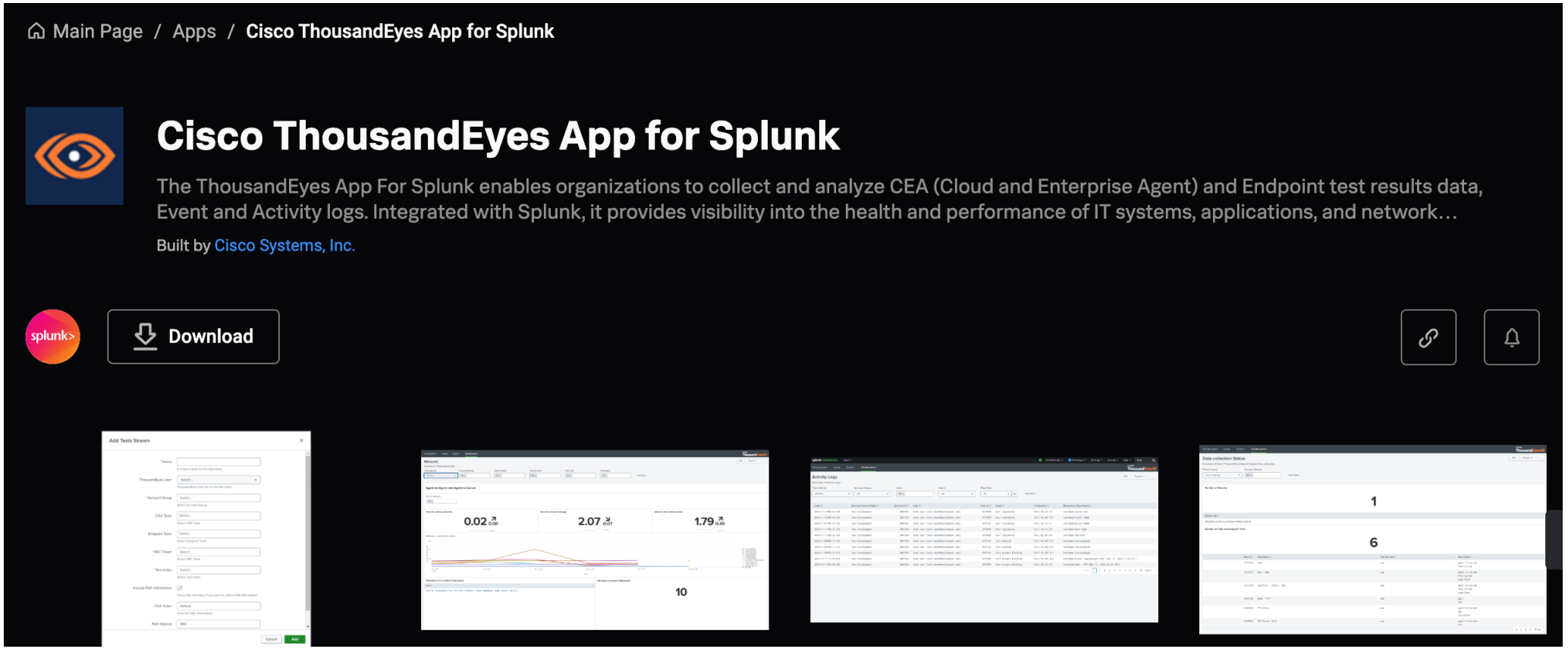



```
index=meraki source="http:meraki-webhook"
```

ThousandEyes Add-On

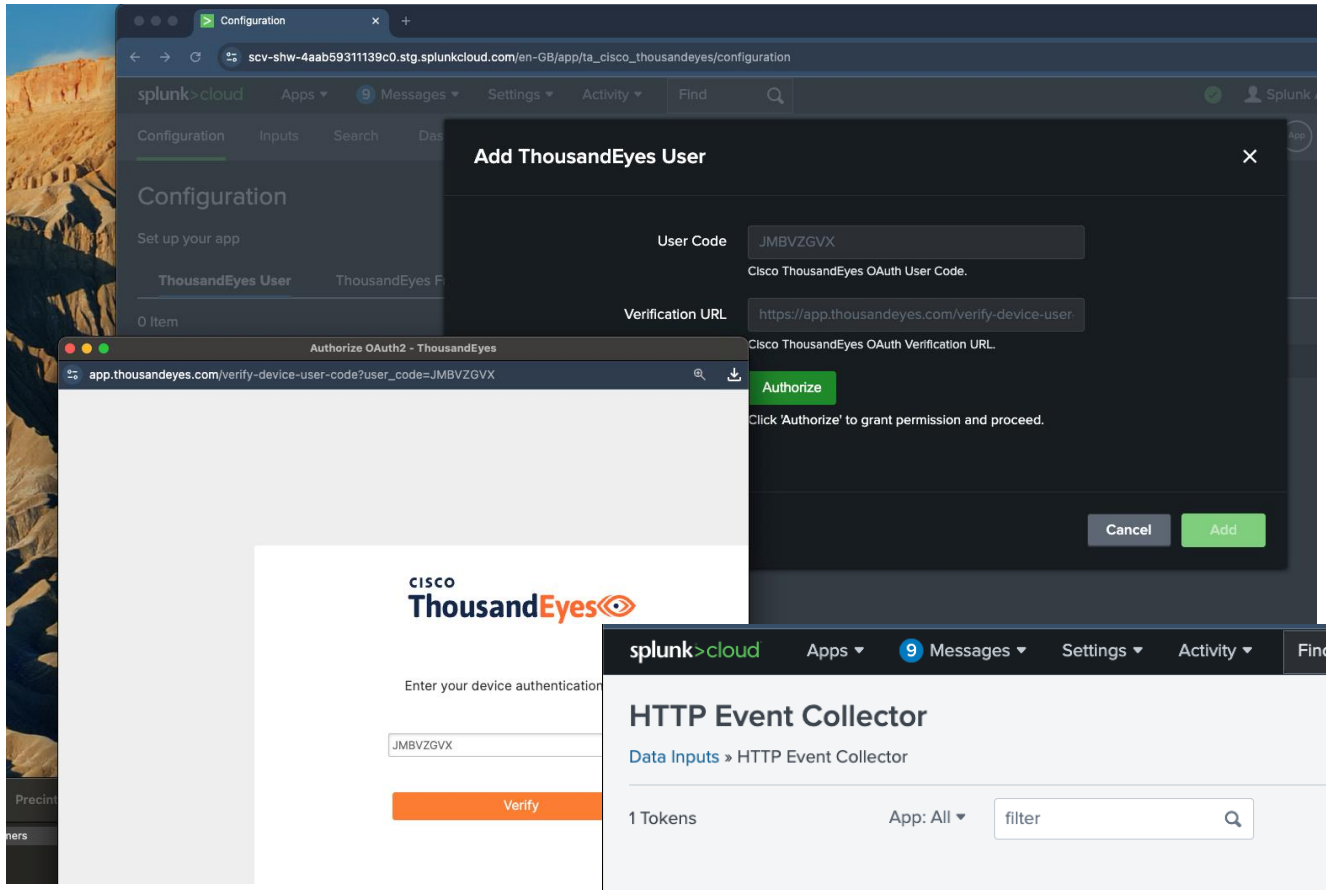
ThousandEyes Add-On for Splunk

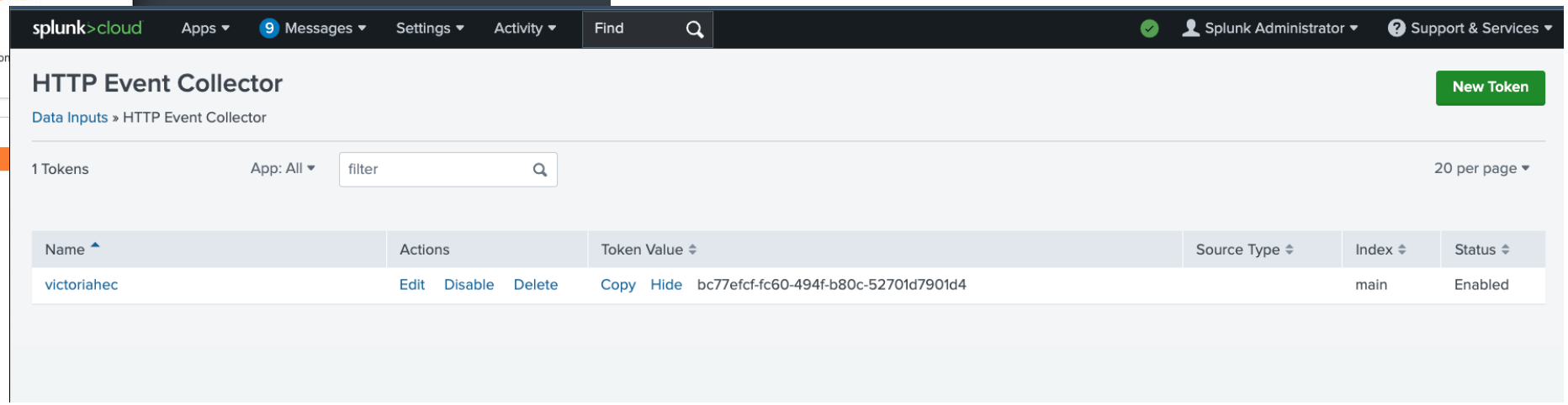
Parses the data from specified sources and stores them into the Splunk indexes



https://splunkbase.splunk.com/app/7719

Add ThousandEyes Account

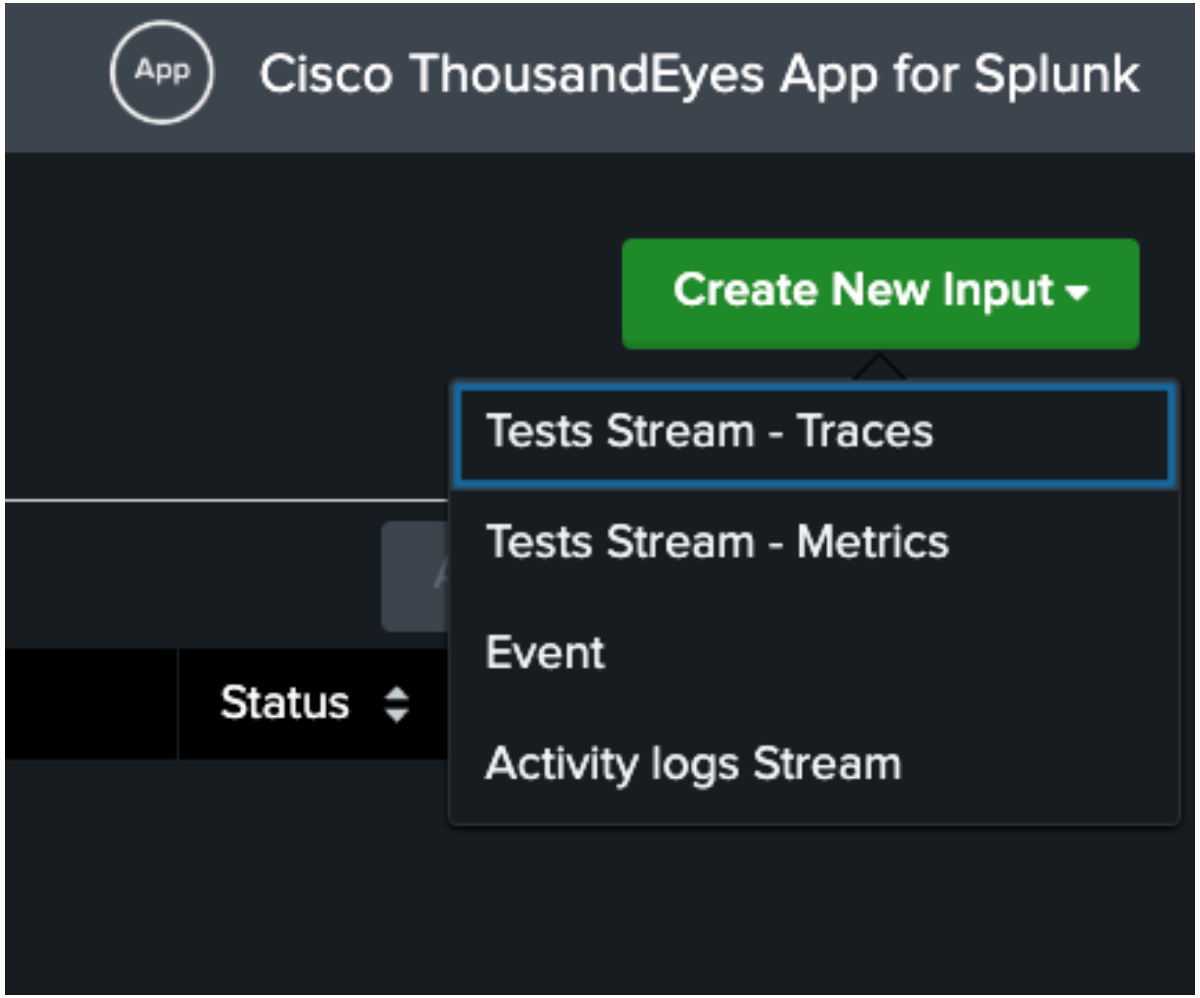




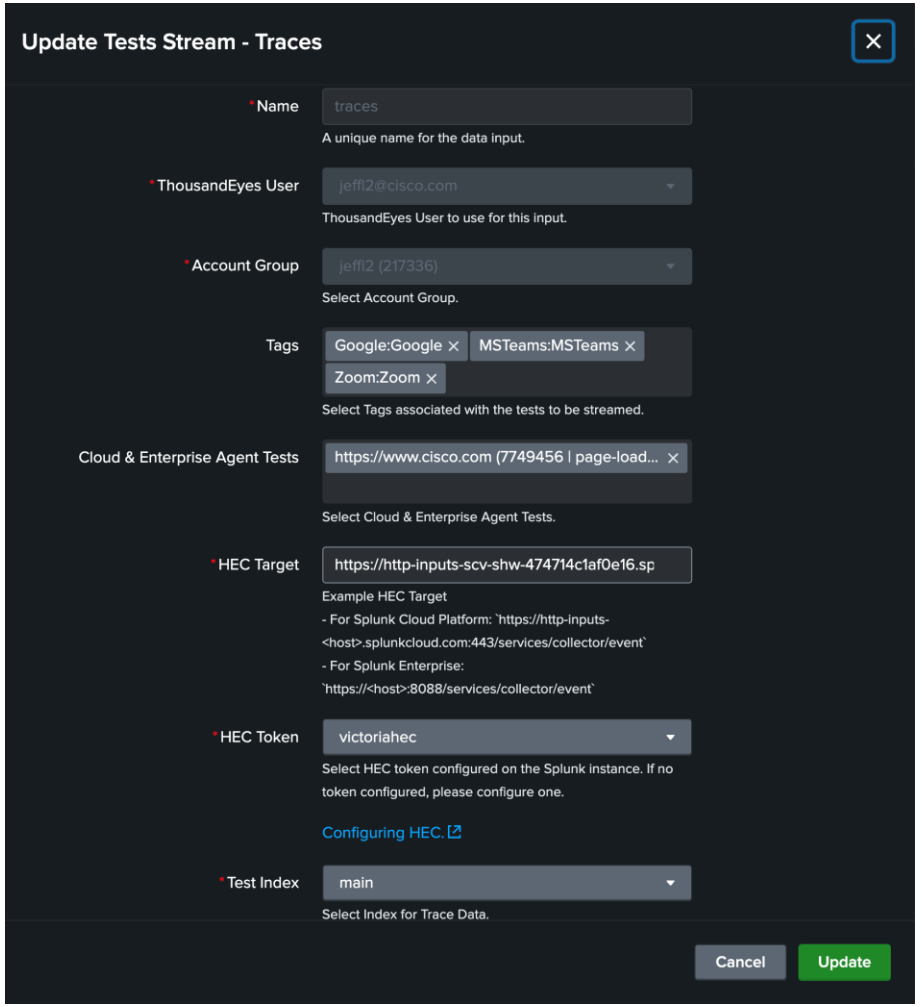
Step 1 – Add ThousandEyes User

Step 2 – Add HTTP Event Collector for ThousandEyes in Splunk

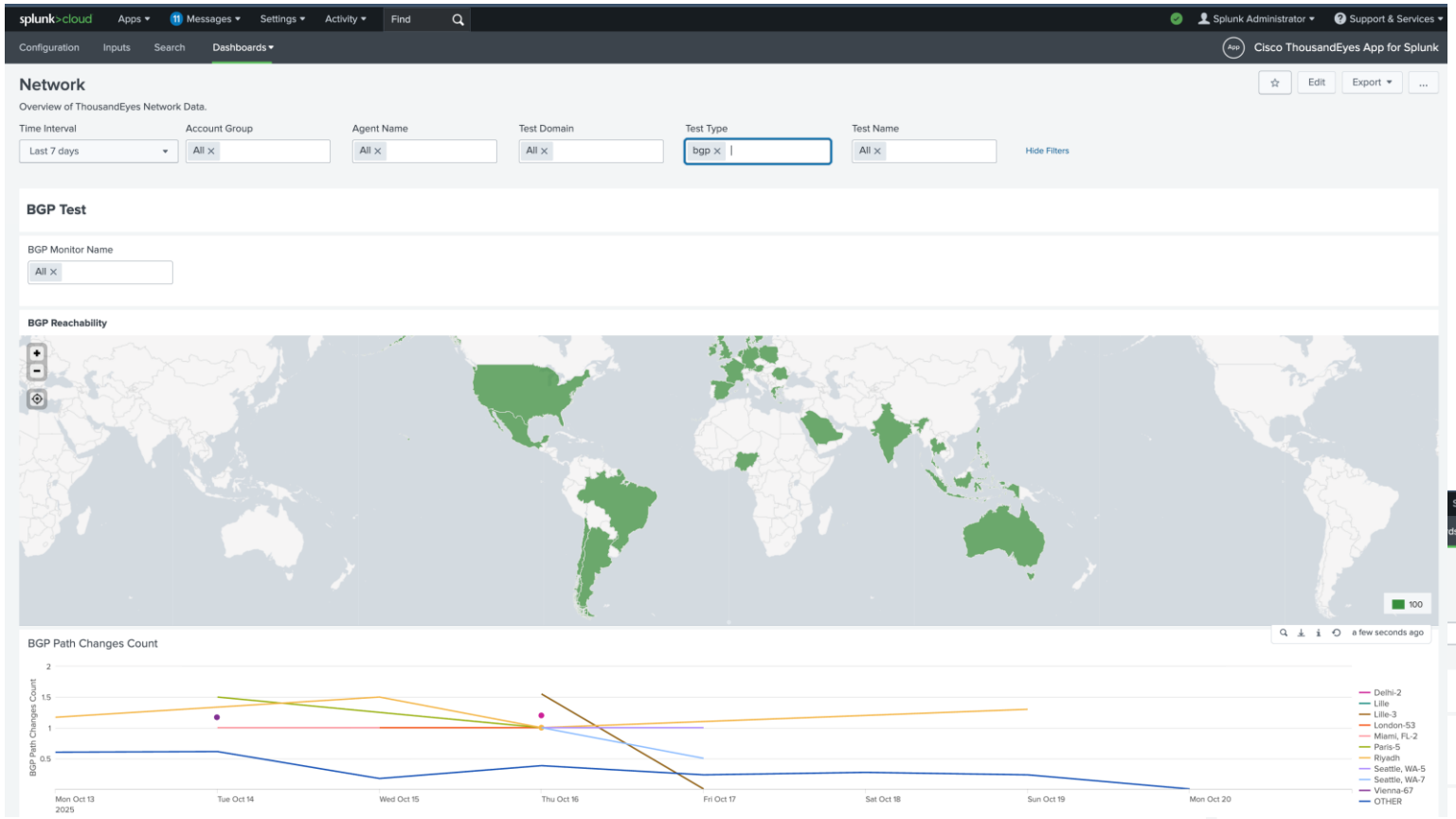
ThousandEyes Add-On for Splunk – Add Inputs

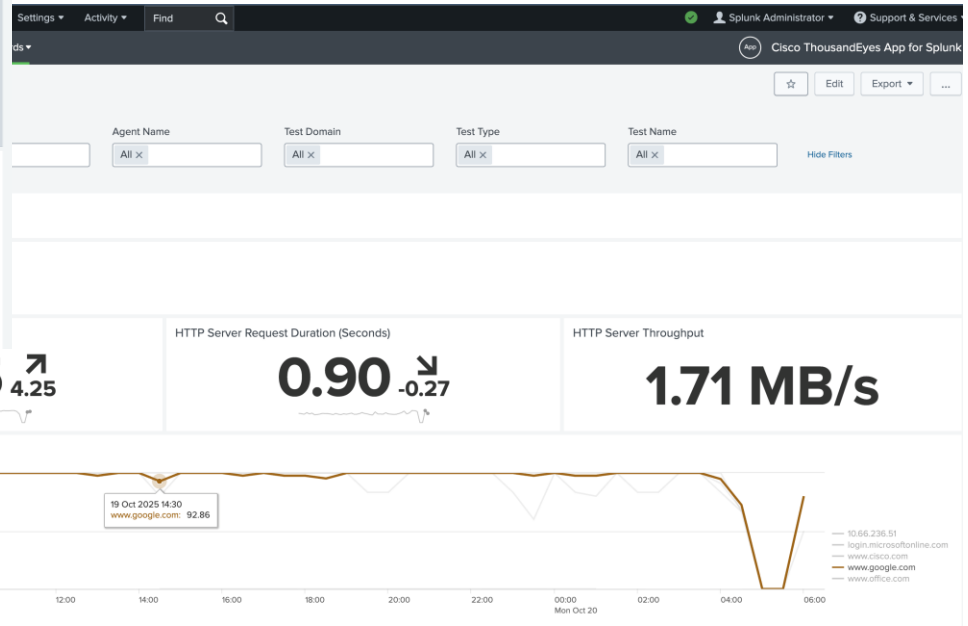


Step 3 – Add ThousandEyes Inputs and select tests

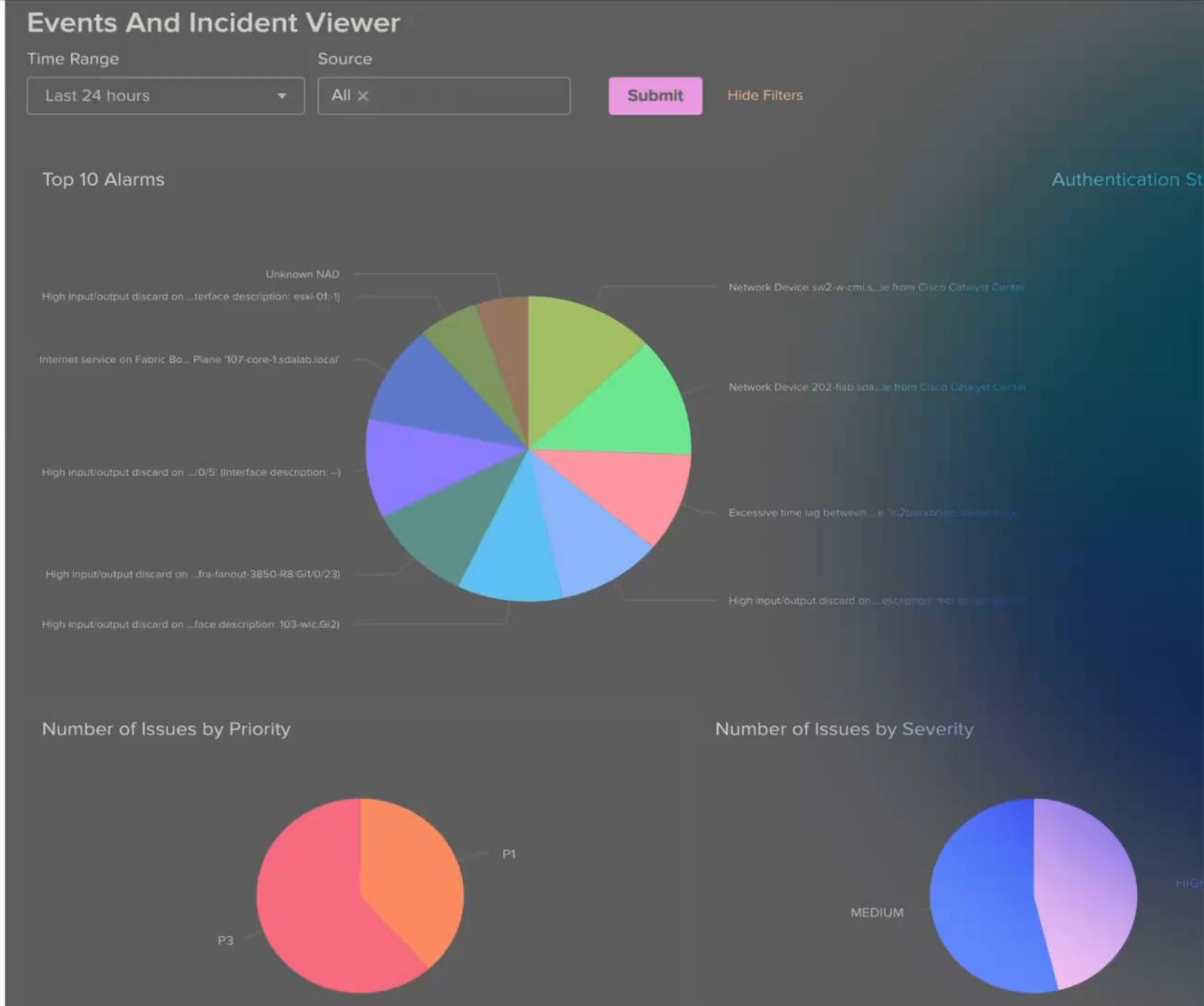


ThousandEyes Add-On for Splunk – Dashboards





Demo – Splunk Enterprise Networking



Splunk IT Service Intelligence (ITSI)

Introduce Intelligence with Splunk ITSI

Complete Business Visibility

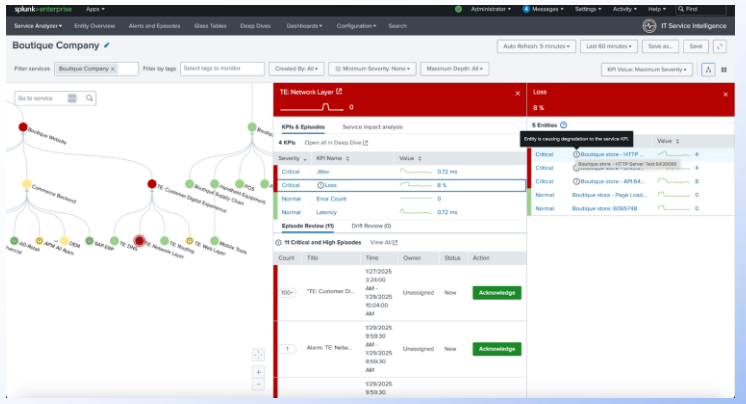
Eliminate fragmented visibility with a single view and accelerate RCA

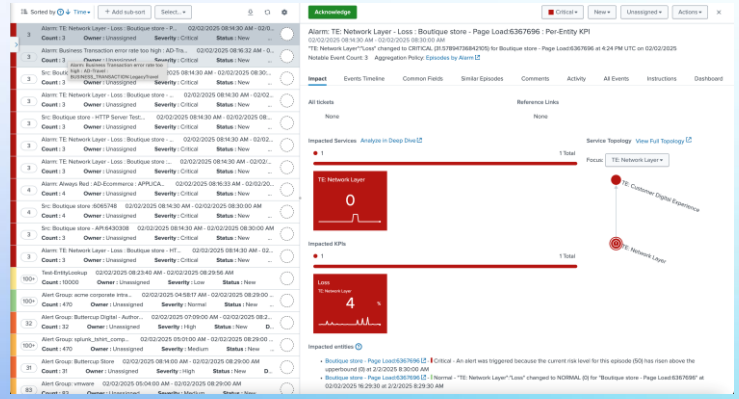
Intelligent Incident Management

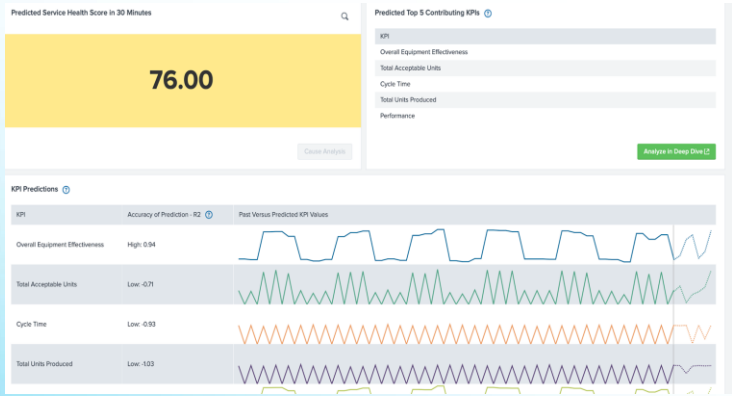
Accelerate MTTR using real-time event correlation and automated prioritization

Proactive Incident Prevention

Detect anomalies and predict issues 30 mins earlier for outage prevention



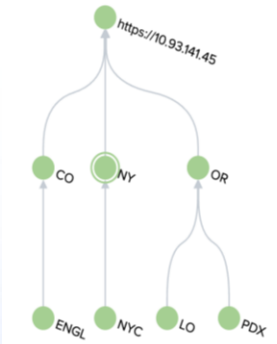


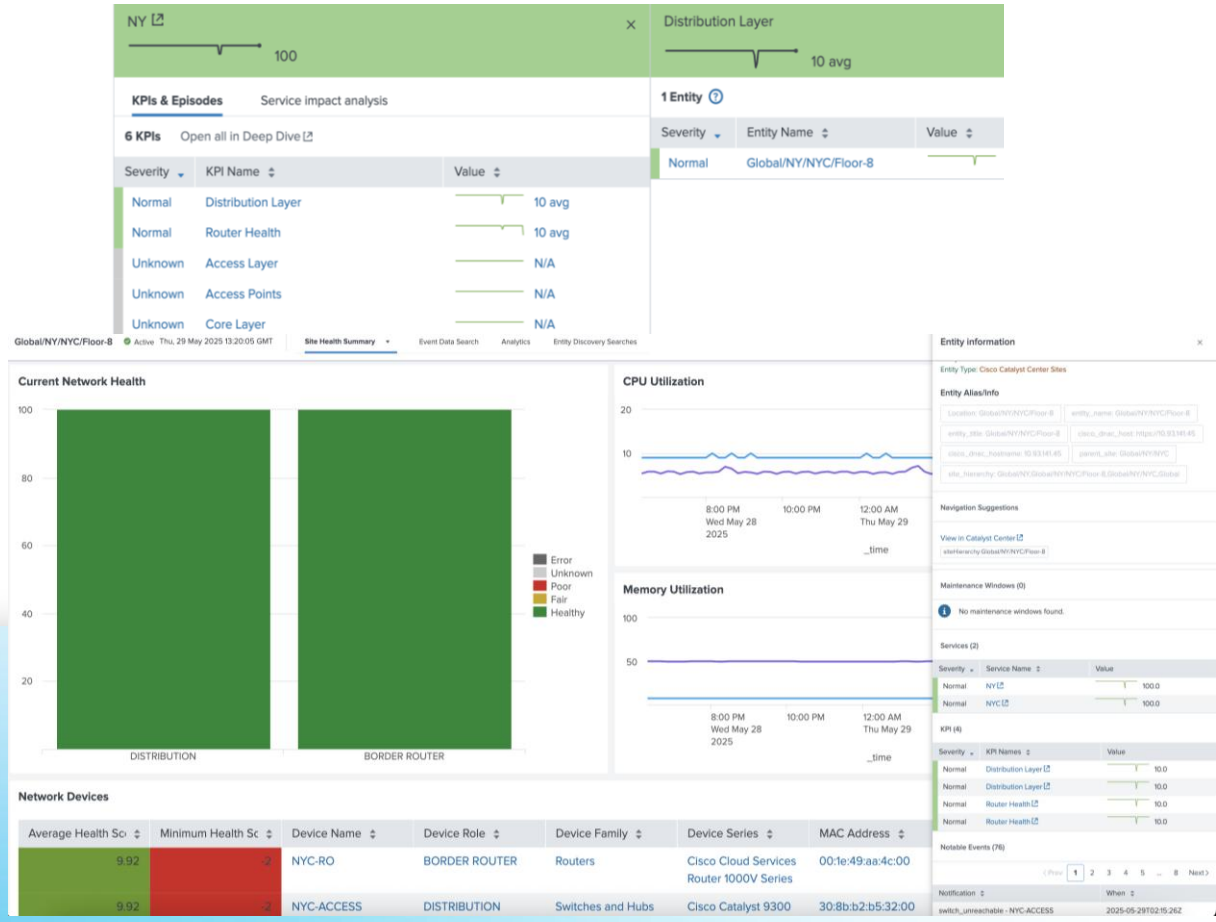


Splunk ITSI and Catalyst Center Integration

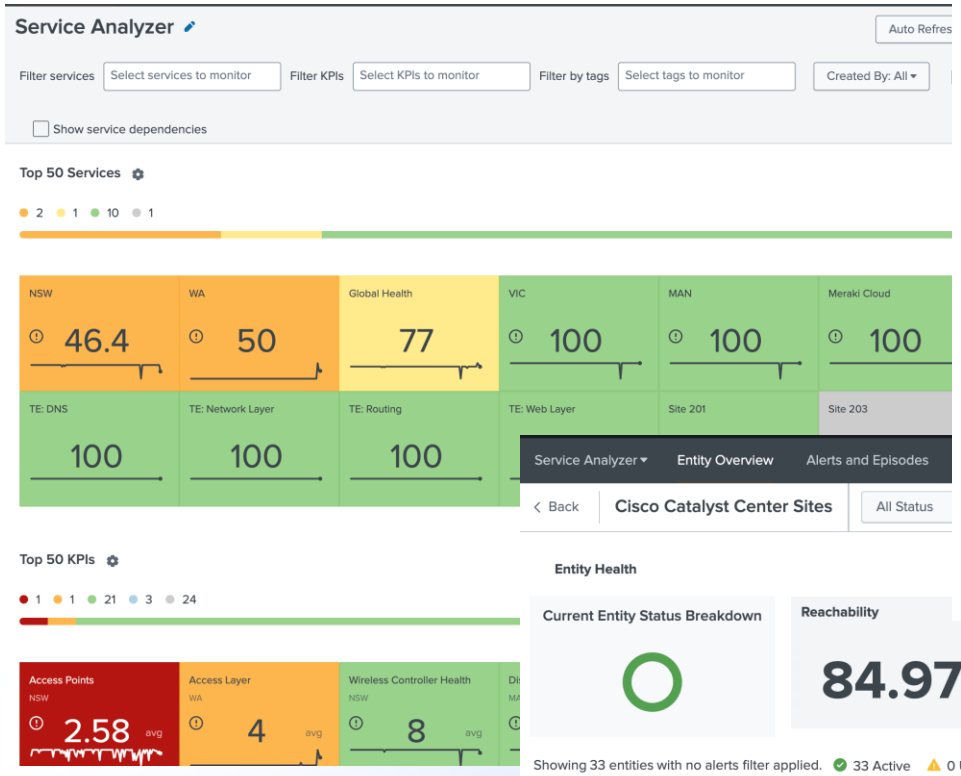
Quickly pinpoint site & device issues in the network with:

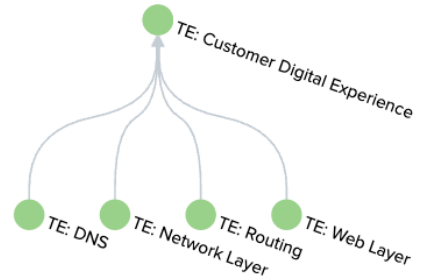
- Site-based dependency mapping for problem isolation
- KPIs and entity models to measure site health incl. core, distribution, and access layers
- Easy alert normalization, deduplication and correlation
- Health visualization of site floors or localized areas to pinpoint unhealthy devices
- In-context drill-downs into Catalyst Center Assurance to perform RCA

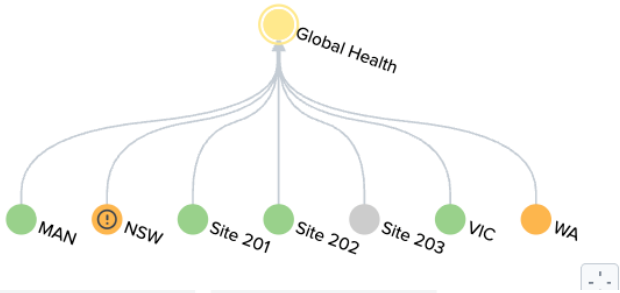


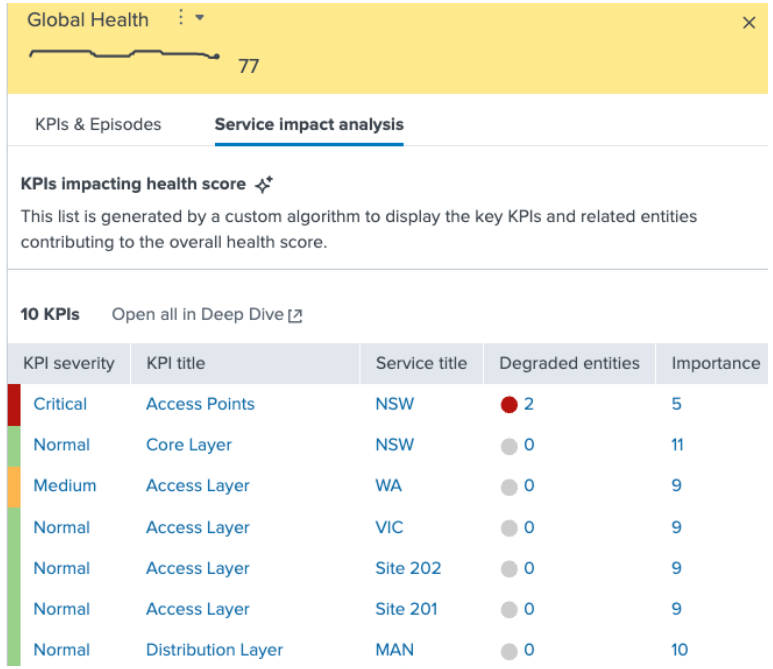


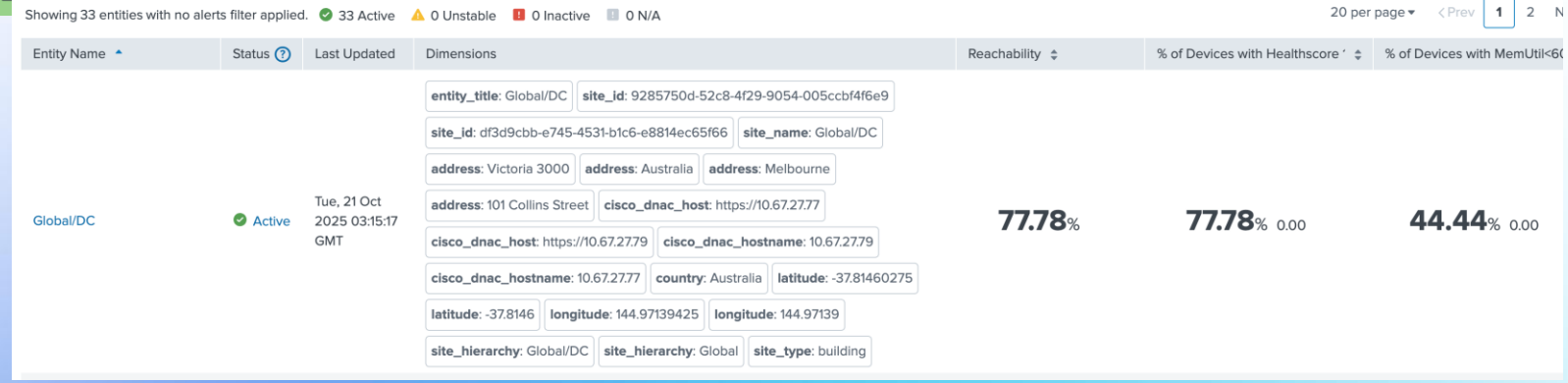
Splunk ITSI Service Analyzer



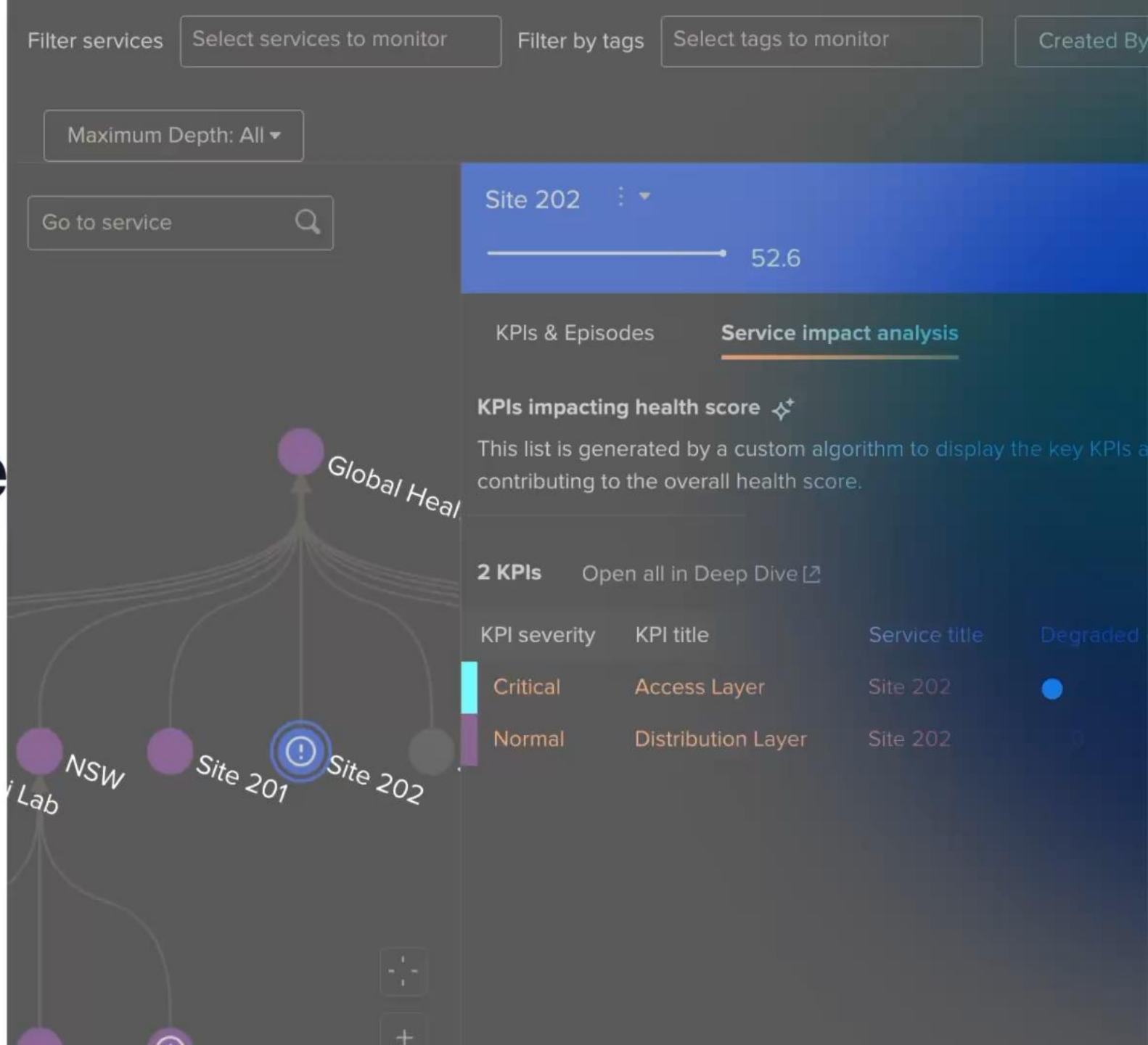








Demo – IT Service Intelligence



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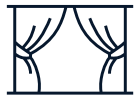

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