



# Central Management Console User Guide

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User Guide



1 - Introduction

# **Chapter 1. Introduction**



# **CMC** overview

The Central Management Console (CMC) aggregates information from thousands of sites and assets to deliver instant awareness of your networks and their activity patterns.

### Overview

The Central Management Console (CMC) makes it easy to have visibility of all your Nozomi Networks sensors. The CMC aggregates information from thousands of sites and assets to deliver instant awareness of your operational technology (OT)/Internet of Things (IoT) networks and their activity patterns, enabling users to quickly troubleshoot issues and accelerate incident response across your network.

CMC can be deployed:

- On-premises
- In a public cloud provider such as *Amazon Web Services (AWS)* or Microsoft Azure
- At the edge on physical or virtual appliances

### **Functionalities**

The *CMC* has been designed to support complex deployments that cannot be addressed with a single sensor. The *CMC* shares the user experience of the sensor. In comparison to the sensor, some functionalities have been added, and some have been removed. The functionalities that have been added let you manage *hundreds* of sensors. The functionalities that have been removed increase efficiency for real-world, geographic deployments of the Nozomi Networks Solution architectures.

### Sensors

The *CMC* **Sensors** page lets you see and manage all the connected sensors. A graphical representation of all the hierarchical structure of the connected sensors and the sensor Map is presented to allow a quick health check on a user-provided raster map.

Once sensors are connected, they are periodically synchronized with the *CMC*. In particular, the Environment of each sensor is merged into a global Environment and Alerts are received for a centralized overview of the system. Of course, Alerts can also be forwarded to a *security information and event management (SIEM)* directly from the *CMC*, thus enabling a simpler decoupling of components in the overall architecture.

### Synchronization

To synchronize data, the sensors must be running the same major *Nozomi Networks Operating System (N2OS)* release, or one of the two prior major ones. For example, if the *CMC* is running version 23.0.x (the major release is 23.0), sensors can synchronize if running one of the following versions: 23.0.x, 22.5.x or 22.0.x.

Firmware update is also simpler with a *CMC*. Once the new firmware is deployed to it, all connected sensors can be automatically updated.

# **Functionalities**

A description of the differences in functionalities between the Central Management Console (CMC) and sensors. The actions shown below are only applicable for CMCs that are in **All-In-One** mode, not **Multicontext** mode.

Table 1. Node actions

### Node actions

Action	Sensor	СМС
Configure node	$\bigcirc$	8
A Show alerts	$\bigcirc$	$\checkmark$
Show requested traces	$\checkmark$	8
Request a trace	$\bigcirc$	8
없 Manage Learning	$\checkmark$	$\checkmark$
	$\checkmark$	$\checkmark$

### Network links

### Table 2. Network links

Action	Sensor	СМС
Configure node	$\bigcirc$	8
A Show alerts	$\bigcirc$	$\bigcirc$
Show requested traces	$\bigcirc$	8
Request a trace	$\checkmark$	8
O Show events	$\bigcirc$	8
Show captured urls	$\bigcirc$	8
Manage Learning	$\checkmark$	$\checkmark$

### Table 2. Network links (continued)

Action	Sensor	СМС
	$\bigcirc$	

### **Process variables**

### Table 3. Process variables

Action	Sensor	СМС
Configure variable	$\bigcirc$	8
<b>Q</b> Variable details	<ul> <li>Image: A start of the start of</li></ul>	<ul> <li>Image: A start of the start of</li></ul>
Add to favourites	<ul> <li>Image: A start of the start of</li></ul>	<ul> <li>Image: A start of the start of</li></ul>

# Alerts

A description of alerts management in a Central Management Console (CMC).

Alerts management in the *CMC* is similar to alerts management in a sensor. However, in the *CMC*, you can have all the alerts, from all the sensors, in one centralized place.

In a sensor, you can create a query, and therefore an assertion, that includes all the nodes, or links etc., for your complete infrastructure. You can create a *Global Assertion*. This is one or more groups of assertions that can be propagated to all the sensors. The *CMC* has control of these assertions, and sensors cannot edit or delete them.

It is possible to configure the *CMC* to forward alerts to a *SIEM* without the need to configure each sensor. For more details, see **Data integration**.

# Updates

A description of the release update and rollback operations when you have a Central Management Console (CMC) and one or more sensors.

The Nozomi Networks update bundle applies to both the *CMC* and Guardian, except in the case of the Docker installation. It works for all physical and virtual sensors.

Once a sensor is connected to a *CMC*, the *CMC* will control all the updates. The software bundle is propagated from the *CMC* and, once the sensor receives the bundle, you can do the update manually, or automatically. You can configure this behavior in the **General settings** section of the **Synchronization settings** page.



### Figure 1. Let user perform updates section

If the *CMC* is configured to allow manual updates, the sensor's status bar displays a message that notifies you as soon as the sensor receives the update bundle.

n 🛷 🛛 LIVE HOST nozomi-n2os.local 20.0.4-06221024\_6DB05 Time 15.51:08.517 DISK 517M used / 4.1G free UPDATE AVAILABLE English 🗸

#### Figure 2. Update available notification

The update process from the *CMC* can proceed as described in **Software update and rollback**. After the Central Management Console is updated, each sensor will receive the new software update.

If an error occurs during the update procedure, a message shows next to the related sensor's version number on the **Sensors** page.

To Rollback, first rollback the Central Management Console, and then proceed to rollback all the sensors as described in **Software update and rollback**.



# **Chapter 2. Sensors**



The **Sensors** page lets you view all of the sensors that you have in your system.

The **Sensors** page has these three tabs:

- List
- Map
- Graph

### List

The List page lets you view all of the sensors that you have in your system.

NOZ	OMI Sensors () Alerts Assets	Va Queries	Smart Polling	. Arc				ක් ම
Sensors							Liet	Man Granh
@ %	Quick search			Page 1 of 1, 2	0 entries	Đ	port ( <sup>1</sup> ) Live (	• G selected •
TYPE	HOSTNAME	MODEL	IP	HEALTH	# SENSORS	>		
0	ch-lab-sg-ns20-1.intra.nozominetworks.com	NS20	10.41.43.87	🙆 Good	7	\$		8100 C
TYPE	HOSTNAME	MODEL	IP	HEALTH	# SENSORS	ch-lab-sg-r	1s20-	
$\otimes$	ch-lab-sg-rc-brl-3.intra.nozominetworks.com	NRC-5	10.41.43.165	O Unreachable	0	1.intra.nozo	minetwor	ks.com
8	RTP-Sentjur	NRC-5	10.41.43.1	O Poor	0			
$\otimes$	ch-lab-sg-rc-brl-2.intra.nozominetworks.com	NRC-5	10.41.43.164	O Unreachable	0	ID	b9ff4	4ffc
$\otimes$	ch-lab-sg-rc-brl-l.intra.nozominetworks.com	NRC-5	10.41.43.163	O Unreachable	0	Version	23.3/	0-09061731_986C7
$\otimes$	ch-lab-sg-rc-brl-4.intra.nozominetworks.com	NRC-5	10.41.43.166	O Unreachable	0	Description		
$\otimes$	ch-lab-sg-R50asRC-01.intra.nozominetworks.com	NSG-R50	10.41.43.105	🙆 Good	0	Site		
$\otimes$	ch-lab-sg-iox-catalyst9300.intra.nozominetworks.com	Container	10.41.43.149	O Poor	0		# Alasta (Fee)	1
	امما مردم نصمهم	VICEDIEC	10 (1128 10	Coord	0	$\wedge$	# Alerts	500000
a a	ch lab ca pol 1 jatra pozominetworke.com	VISERIES NC1	10.41.128.10	Good Good	0	<u> </u>	Risk (5m)	7.0
	ab r50 intra pereminaturale com	NSC DED	10.41.43.36	G Good	0			
	lab aca e 2 late estaminaturale com	NSG-RSU	10,41,43,26	Good Good	0		Stale	No
N A	ab lab co poE00metaturo 1 jatro poteminetuario com	NG FOOD	10.41.43.31	Good Good	2		Last sync Uptime	0d 6h 30m 51s
N N	cn-lab-sg-ngsourprototype-Lintra.nozominetworks.com	NG-SOUR	10.41.43.32				Resources usage	
N A	chilabisg-vm-guardian-arcinula.nozominetworks.com	V-SERIES	0.41.43.144	Good Good	331	Good	RAM 30%	
v v ⊠ a	chrabisgritisonzintratiozoffinetworks.com	NECL	10.41.43.57	Good Good	0		Disk 🛂 🛠	
	In a human masteriate acteriation works com	N SERIES	10.41.47.61	Good	0		CPU 0 25	62% 50 75 100
v ⊗ ⊠ &	chilsh-rg-d60-lintra poteminetworks.com	v-SERIES	10.41.43.27	G Good	0			
	on endergen soverande av soverande even of Record in	Container	10.41.43.27	Lipreachable	0			
V V	( Labora ) ( The state )	container	10.41.43.30	Concountable	0	Throughput		

### Figure 3. Sensors list

### Force update

The force update icon lets you do a force update on the selected sensors.

### Allow/disallow

The allow/disallow ଷ icon lets you allow or disallow sensors.

### Quick search

The quick search field lets you easily do a search on the current page.

#### Export

The **Export**  $\stackrel{\frown}{\square}$  icon lets you export the current list in either *comma-separated value* (CSV) or Microsoft Excel format.

#### **Download Arc**

The **Download Arc** dropdown lets you select, and download, the applicable Arc package for your *operating system (OS)* and architecture.

### Live

The Live toggle lets you change live view on, or off. When live mode is on, the page will refresh periodically.

### Refresh

The **Refresh**  ${}^{\bigcirc}$  icon lets you immediately refresh the current view.

### **Column selection**

The columns selection  ${}^{igodoldsymbol{\Theta}}$  icon lets you choose which columns to show or hide.

### Information pane

The information pane to the right of the list of sensors shows additional information for the selected sensor.

It also lets you do these actions shown below.

### Table 4. Sensors list actions

Reference Allow/Disallow sensor	After allowing a sensor, this icon shows: Synchronized data coming from the sensor become part of the Environment of the <i>CMC</i> . Alerts coming from the sensor can be seen in the <b>Alerts</b> section.
L Focus on sensor	Allows to filter out only the sensor chosen data, such as Alerts and Environment.
◆ <b>〕</b> Go to sensor	Connect to a remote sensor directly from the <i>CMC</i> . Select this to open a new browser tab to the sensor selected login page. The action is hidden if the <i>CMC</i> isn't configured to allow this type of communication between sensors and <i>CMC</i> .
Place in map	This action is used to place the sensor on the map.
Toggle version lock	When locked, the sensor will not automatically update its software.
• Force update	Even if it is locked, the sensor will automatically update its software, with the version installed on the <i>CMC</i> .
Clear sensor data on this machine	Clear all synchronized data at the CMC received from the selected sensor. Use this in combination with the clearing of the data on the sensor, and you will be able to restart the synchronization between the sensor and the CMC from an empty state
Delete sensor	Clear all data received from the selected sensor and delete it from the list. If the sensor tries to sync with the <i>CMC</i> again, it shows as disallowed in the list.

# Мар

You can use the **Map** page to upload, and view, a map of the sensors in your environment.



#### Figure 4. Sensors map

### Info(rmation) pane

		List	Мар	Graph
				Upload map
	🖯 🗁 ch-lab-sg-nsg-hs-1.intr	a.nozominetw	orks.com	
	🖯 🗁 Info			
	> IP:	10.41.43	3.28	
Info ►	> CPU:	4%		
	> RAM:	6%		
	🖯 🗁 Data			
	> Risk (5m):	7.0		
	> # Nodes:	5122		
	> # Links:	3578		
	> # Alerts:	26847		
	> # Alerts (5m):	7		

### Figure 5. Info(rmation) pane

The **Info** pane lets you view information for the related sensor. The *identifier (ID)* of each sensor is used in the map to help you identify it. The marker color of the sensor relates to the risk of its alerts.

In the map view, a red indicator to the right of the sensor's *ID* shows the number of the alerts in the last five minutes. This indicator only shows if there are some alerts for the sensor. If the alerts in last 5 minutes increase, the sensor marker will blink for one minute.

If the site of the sensor has been specified in  $\bigotimes$  > System > General, it is possible to enable the **Group by site** option, in the bottom right corner of the map view. The sensors with the same site will be grouped to deliver a simpler view of a complex installation.



### Note:

The sensors map is also available as a widget.

# Graph

The **Graph** page shows a graphical view of all the sensors in you environment.



Figure 6. Sensors graph

### Do a force update on sensors

If you have disabled auto updates, you can use the force update icon to do a manual update.

### Procedure

1. In the top navigation bar, select **Sensors**.

Result: The Sensors page opens.

2. In the top left section, select lambda.

Result: A dialog shows.

3. To confirm, select **Yes**.

Force update for all filtered sensors	×
You are about to update 20 sensor(s). Do you confirm?	
	Yes No

×

No

Yes

### Allow a sensor

The allow icon lets you give permission for a new sensor to connect to Central Management Console (CMC).

### Procedure

1. In the top navigation bar, select **Sensors**.

Result: The Sensors page opens.

2. In the top left section, select the  $^{\circlengthambda{3}}$  icon.

Result: A dialog shows.

3. To confirm, select **Yes**.

Allow all filtered sensors

You are about to allow 20 sensor(s). Do you confirm?

### Export a list of sensors

You can export a list of the sensors from the current view.

### Procedure

1. In the top navigation bar, select **Sensors**.

Result: The Sensors page opens.

2. In the top right section, select **Export**.

Result: A dialog shows.

3. Choose an export format:

#### Choose from:

- Select **CSV** to create a CSV file
- $^\circ$  Select Excel to create a Microsoft Excel file

Exports list		×
ECSV Excel		
Actions	Filename	
No results		

**Result:** The file is created and a Exported message shows.

4. To download the file, in the bottom-left of the dialog, select lacksquare

Exports list		×
Exported! Excel		
Actions	Filename	
۵	export_appliances_57_20230908093055.csv	

### Results

The exported file has been downloaded.

# Upload a map

The **Map** page lets you upload a map of your sensors in your environment.

### Procedure

1. In the top navigation bar, select **Sensors**.

Result: The Sensors page opens.

2. In the top right section, select **Map**.

Result: The Map page opens.

- 3. In the top right section, select **Upload map.**
- 4. Select the image file that you want to upload.

### Results

The map is uploaded.



# **Chapter 3. Alerts**



The **Alerts** page shows all the latest alerts in the system. It lets you view the alerts in different modes, and carry out actions on the alerts.



NOZOMI =	🕬 Sensors	Alerts	Assets	V Queries	Smart Polling	👰 Arc				
Alerts										
Page 1 of 23, 341 entries						Export 📋	Group by incident 🛑 😤	Ŧ	Live 💽 🎵	

### Figure 7. Alerts page menu

The top right section of the **Alerts** page has two icons that let you change between these two options:

- Standard mode (on page 30) 🗐
- Expert mode (on page 31)

# Standard mode

You can view alerts in standard mode to give you an overview of the latest anomalies.

NET	WORKS =	Sensors	Assets E	ueries 🔆 Smart Polling	·Q: Are			
ge 1 of	1, 3 entries				Export [ <sup>↑</sup> ]	Group by incident	💽 🚡 🔻 Live	•Ø   🖬
sk • •	TIME N 4 D N	NAME		DESCRIPTION			Malfarmad	troffic
7	2023-08-14 14:00:22.620	<ul> <li>Malformed traffic</li> </ul>	The IP layer has no data.				2023-08-14 14:00:22.620	Status: open
	<b>2023-08-07</b> 09:43:38.648	<ul> <li>Malformed traffic</li> </ul>	The IP layer has no data.					
7	2023-08-02	Ø Malformed traffic	Invalid IP packet: IP header lengt	h is smaller than the expected siz	e	MAC	Source 72:cf:c4:75:d3:b3	01:00:5e:00:00:fb
	14:30:45.633					Zone		
						Is security	true	
						Protocol	unknown	
						What hap	pened?	
						The IP laye	r has no data.	
						Possible o	ause	
						A L7 malform malformed p software vers source of a po	ed packet has been de acket can target knowr ions, and thus should b ossible attack.	tected. A maliciously nissues in devices or e considered carefully a
						Suggeste	d solution	
						Investigate or presence of n	n the protocol impleme nalicious actors.	ntation and the possib
								Open detai

### Figure 8. Standard mode

### Risk

This shows the risk associated to each alert or incident.

### Time

The time related to each event.

### Name

The name category of the event.

### Description

This shows a detailed description of the related event.

### Analysis

If you can select a row, this pane will show a more detailed analysis of the alert.

## Expert mode

You can view alerts in expert mode to give you a detailed view of the alerts in the system. This lets you filter, sort, and analyze the information in detail.

Expert mode shows a comprehensive table layout, with details on the alerts and incidents listed, which include:

- Addresses
- Labels
- The roles of the involved nodes, zones, protocol, and ports used in the involved transactions, and more

NOZOMI 🖶 🕬 Sensors 🔇	Alerts Queries	🛠 Smart Polling 🔆 Arc	\$ \$ \$
Alerts			
Page 1 of 1, 3 entries	Export 📋	Group by incident 💿 🚡 🔻 Live 💽 ʃʃ Σ Count by field_	• • 12 selected •
ACTIONS RISK TIME	ID TYPE ID	COUNTE DESCRIPTION	ROTOC IP SRC IP DST
7 2023-08-14 14:00:22.620	9b3c82c8	1 The IP layer has no data.	
•••• 7 2023-08-07 09:43:38.648	29183285	1 The IP layer has no data.	
7 2023-08-02 14:30:45.633	8a34431b	1 Invalid IP packet: IP header length is small	

### Figure 9. Expert mode

### Export

The **Export**  $\Box$  icon lets you export the current list in either CSV or Microsoft Excel format.

### Group by incident

The **Group by incident** icon lets you group alerts by incident. This will show incidents, and hide all the alerts that belong to it.

### Filter

The filter **T** icon opens a list of items that you let you filter the results.

### Live

The **Live** toggle lets you change live view on, or off. When live mode is on, the page will refresh periodically.

### Refresh

The **Refresh**  $\bigcirc$  icon lets you immediately refresh the current view.

### Count by field

The  $\Sigma$  Count by field dropdown lets you select a data field on which to group and count the alerts.

### **Column selection**

The columns selection <sup>©</sup> icon lets you choose which columns to show or hide.

### View alerts in standard mode

You can view alerts in standard mode to give you an overview of the latest anomalies.

### Procedure

1. In the top navigation bar, select Alerts.

Result: The Alerts page opens.

2. In the top right corner, select the standard mode  $\square$  icon.

Result: The Standard mode (on page 30) view opens.

## View alerts in expert mode

You can view alerts in expert mode to give you a detailed view of the alerts in the system. This lets you filter, sort, and analyze the information in detail.

### Procedure

1. In the top navigation bar, select Alerts.

Result: The Alerts page opens.

2. In the top right corner, select the expert mode  $\square$  icon.

**Result:** The Expert mode (on page 31) view opens.

# **Closing alerts**

When you close an alert, or incident, a dialog lets you select a reason, and specify the learning process.

Closing 0 inc	ident(s) and 1 alert(s) *
	Choose a reason 👻
This is an incident This is a change Custom reason	
Comment	
Comment	
	Ok Cancel

### Figure 10. Alerts closing dialog

The **Reason for closing** dropdown has these options:

- This is a change: If the cause of the alert is an intended change to the network, such as:
  - A new computer being attached
  - $\circ\,$  New communication between two nodes that were not previously communicating

Guardian can learn the change that has been detected as part of the environment baseline. When you close an alert in this way, the *intrusion detection system (IDS)* is instructed to learn the related objects. For example, when a VI:NEW-NODE alert is closed as a change, Guardian registers that the corresponding node is part of the environment and will not raise subsequent VI:NEW-NODE alerts about the same node.

• This is a change: If the cause of the alert is an intended change to the network, such as a new computer being attached, or a new communication between two nodes that were not talking before, the change detected by Guardian can be learned as part of the environment baseline. When closing an alert in this way, the IDS is instructed to learn the corresponding objects. For example, when a VI:NEW-NODE alert is closed as a change, Guardian registers that the corresponding node is part of the environment and will not raise subsequent VI:NEW-NODE alerts about the same node.

- This is an incident: If the cause of the alert is a configuration error, an attack, a malfunctioning device, or other security incident, the change is not learned as part of the environment baseline. When closing an alert in this way, the IDS is instructed to delete the corresponding objects. For example, a new node entering the network for the first time causes a VI:NEW-NODE alert. If an alert closes as an incident, reference to the new node is deleted. The VI:NEW-NODE alert is raised again in subsequent communication involving the same node.
- **Custom reason**: This lets you write a custom reason for closing an alert. You can enter a text string as the closing reason, with a request to apply one of the two described behaviors.

You are about to close 0 incident(s) and 1 * alert(s)
Reason for closing
Custom reason 🗸
Custom reason
New controller installed
<ul> <li>Treat as incident</li> <li>New incidents/alerts will be generated if a similar event happens again.</li> <li>Learn</li> <li>Learn the change, no new incidents/alerts will be generated if a similar event happens again</li> </ul>
Comment Team C will be responsible for the maintenance
Ok Cancel

### Figure 11. Closing alert for custom reason with comment

You can add a comment so that it shows in the **alert audit** log.

Environment	Audit alert operations
Audit timeline	
a day ago	Acknowledged by John Smith
2 days ago	<b>Closed as a change - New controller installed</b> by Jane Doe «Team C will be responsible for the maintenance»

Figure 12. Audit alert operations

### Edit a playbook associated with an alert

A playbook associated with an alert can be modified. A change you make on the playbook only affects the playbook related to that specific alert.

### About this task

You can edit a playbook associated with an alert from the **Playbook** tab in the **Alerts** page.

### Procedure

1. In the top navigation bar, select Alerts.

Result: The Alerts page opens.

- 2. Find the alert on which to edit the assigned playbook.
- 3. Select the alert, then select **Playbook** at the bottom of the screen.
- 4. To edit the playbook, select **Edit**.

		Details on @ schemuloimed tiwind What happened?
stails (at the alert	time)	The UDP header in the packet contains a wrong data length
tatus	epen	1428 bytes are advertised, but 1434 bytes are found in the psyload.
iote		Possible cause
ource:	- 38:0e-4d29:22:6e	A L7 malformed packet has been detected. A maliciously malformed packet can target known issues in devices or
Nestination:	- 00.08x3#7#390	software versions, and thus should be considered carefully a source of a possible attack.
apture device:	troq	Suggested solution
		investigate on the protocol implementation and the possib presence of malicious actors.
Environment	Audit alert operations MITIBE ATTRCK Enterprise Playbook	
aybook		
spicious Activity		

### Figure 13. Playbook tab

- 5. Edit the playbook as necessary.
- 6. Select Save.

### Note:

The playbook template from which the alert playbook was generated remains unchanged, as do all other alert playbooks generated from the same playbook template.
# **Chapter 4. Assets**



The **Assets** page shows all the physical components and systems in the local network environment and their associated details. It also lets you perform actions on those assets. Depending on the nodes and components involved, assets can range from a simple personal computer to an operational technology (OT) device.

The top right section of the Assets page has these two tabs:

- List (on page 39)
- Diagram (on page 41)

# List

The **List** page shows all the assets in table format.

	OMI = [	Sensors () Alerts	Assets V Queries	Smart Polling	·Ċ. Arc		\$ \$
Assets							List Diagram
Page 1 of 6,	131 entries				Export	Confirmed MACs only 💽 Live 🖲	● 🕤 🔹 22 selected 🕶
ACTIONS	CAPTURE DEVI	NAME		TYPE		OS/FIRMWARE	
•••							
□ ≇ 🖪 🕈	eml	iPhone-67.local	-				192.168.68.116
🗆 🏛 🖪 🏕	em1	🍵 iPad-7.local	-				192.168.0.142
🗆 莘 🖪 📌	em1	Surface_Pro_8.local	-				fe80::e2bb:a057:b9d
🗆 華 🖪 👼	em1	CHPs-AirPort-Express.local	-				(multiple)
□ ≇ 🗅 🕈	eml	192.168.69.51	-				192.168.69.51
□ 莘 🛛 🕈	eml	BRWA8934A93B2DC.local	-				fe80::aa93:4aff:fe93:t
□ ≇ 🗅 🕈	eml	fe80::1ccb:5916:8319:7142	-				fe80::1ccb:5916:8319:'.
🗆 莘 🙆 👼	eml	Naymis-iPhone.local	-				10.0.1.18
🗆 莘 🗅 📌	eml	Craigs-Mac-Studio.local	-				fe80::48b:c97a:b04e
🗆 華 🗅 📌	eml	🍵 iPad.local	-				fe80::14ab:4e17:4c9d
□ ≇ 🗅 🕈	eml	Craigs-iPhone-13-mini.local	-				192.168.69.12
🗆 🏛 🖪 🏕	em1	🍵 iPad.local	-				fe80::1cd4:a715:cbe4
□ ≇ 🗅 🕈	eml	192.168.68.69	-				192.168.68.69
🗆 華 🙆 👼	em1	🖏 Craigs-Mac-Studio.local	computer				10.0.1.9
🗆 莘 🙆 📌	eml	192.168.68.58	-				192.168.68.58
🗆 莘 🖪 📌	eml	Naymis-iPhone.local	-				fe80::106b:c3d1:a01:a
□ ≇ 🗅 🕈	eml	DESKTOP-QIASE9Q.local	-				fe80::1b07:ebc0:307a
- 🛱 🖉 🥐	eml	S MACBOOKPRO-CACB	computer		4	Windows XP	(multiple)

#### Export

The **Export** (1) icon lets you export the current list in either CSV or Microsoft Excel format.

#### **Confirmed MACs only**

The **Confirmed MACs only** toggle lets you select only assets that have a confirmed *media access control (MAC)* address.

#### Live

The **Live** toggle lets you change live view on, or off. When live mode is on, the page will refresh periodically.

#### Refresh

The **Refresh**  $\mathfrak{O}$  icon lets you immediately refresh the current view.

# **Column selection**

# Diagram

The **Diagram** page uses the Purdue model format to display the assets. Assets are shown in separate rows, according to their level.

sets								List <b>Diagran</b>
Quick search						Live • 💭	Selection info	
evel *						Info ▶	Fe80::101exd8d6:8f8:3069     papliance host:     label:     interference inter	nozomi-n2os.local iPhone-67.local
aigs-iPhone-13-mini.	fe80::45e:e2ba:66c8.5c	Naymis-iPad.local	fe80:1492:e0d2:c0b8:3	Naymis-iPhone.local	iPad-Pro-3.local		<ul> <li>ip:</li> <li>mac address:</li> <li>mac vendor:</li> <li>zone:</li> </ul>	re80::101e:d8d6:388:3069 72:36:4c:ea:7b:82 (unconfirmed Private Address (unconfirmed Undefined
Naymis-iPad.local	fe80:454:4a92f6d7:4ft	172.20.10.9	Naymis-iPhone.local	iPhone-10.local	iPhone-Isa.local		> is al enriched: > type: > is broadcast: > is public:	raise - faise faise
iPhone-67.local	TL-WPA4220	iPhone-106.local	Naymis-iPhone.local	Android.local	Apple-TV.local		<ul> <li>&gt; is compromised:</li> <li>&gt; is confirmed:</li> <li>&gt; is learned:</li> <li>&gt; is fully learned:</li> </ul>	false true true true
iPad-Pro-3.local	iPad.local	iPad-Pro-3.local	BRWA8934A93B2DC.k	Craigs-Mac-Studio.loca	S DESKTOP-QIASE9Q.lo:		<ul> <li>&gt; is disabled:</li> <li>&gt; roles:</li> <li>&gt; appliance hosts:</li> <li>&gt; links count:</li> </ul>	false other nozomi-n2os.local 1
nozomi-n2os							<ul> <li>&gt; protocols:</li> <li>&gt; created at:</li> <li>&gt; first activity time:</li> <li>&gt; last activity time:</li> </ul>	mdns 2023-07-04 12:48:34.223 2023-07-04 12:48:34.223 2023-07-05 17:19:42.676

#### Figure 14. Diagram page

### Search bar

The search bar lets you search for a specific item.

#### Live

The live boggle lets you immediately refresh the graph.

#### Refresh

The refresh  $\mathcal{O}$  icon lets you immediately refresh the graph.

#### Levels section

The levels section shows an icon for each asset, and shows on which level of the Purdue model it is.

#### Selection info

When you select the link below an asset's icon, the **Selection info** pane shows more details for the selected asset.

# **Details window**

The details window lets you view more detailed information for an assets.



#### Figure 15. Asset details window

This details window shows more details for an asset.

The top section of the screen contains generic data. You can hover your mouse over

the information  $\mathbf{I}$  icon to display the source, granularity and confidence of the corresponding piece of data. Data includes:

- *internet protocol (IP)* (address)
- Roles
- Vendor
- MAC address
- MAC vendor

The details window has these tabs:

- Overview (on page 48)
- Sessions (on page 49)
- Alerts (on page 50)
- Software (on page 51)
- Vulnerabilities (on page 54)
- Variables (on page 55)

# Information icon

When you hover over the **i** icon, you can see information for:

- Source
- Granularity
- Confidence

#### Source

Information source	Description
manual	Information that is manually added from the configuration
imported data	Imported information
passive detection	Information from deep packet inspection
asset-kb	Information from Asset Intelligence
smart-polling	Information from Smart Polling

### Granularity

Level of detailed information	Description
manual-or-import	Information manually added or imported
complete	Detailed information that has been extracted
partial	Detailed, but not complete information
generic	A family/generic value is found, but it is not detailed
unknown	Unknown

# Confidence

Level of confidence in information	Description
manual-or-import	Information manually added or imported, with the highest level of confidence at this level
high	High level of confidence
good	Good level of confidence
low	Low level of confidence
unknown	Unknown confidence

# **Configure an asset**

The **Lists** page lets you configure assets.

#### Procedure

1. In the top navigation bar, select **Assets**.

Result: The Assets page opens.

2. In the Actions column, to the left of the applicable asset, select the  $\rightleftharpoons$  icon.

Configure <b>192.168.69.11</b>	×
Type (current value source: source.none)	
<unknown> 🗸</unknown>	
Save	Cancel

- 3. From the dropdown, select the applicable type.
- 4. Select **Save**.

#### Results

The asset has been configured.

# Generate a PDF report of an asset

The Lists page lets you generate a report in portable document format (PDF).

#### Procedure

1. In the top navigation bar, select Assets.

Result: The Assets page opens.

2. In the Actions column, to the left of the applicable asset, select the 🕑 icon. **Result:** A dialog shows.

3. Optional:

If necessary, select the **Include installed software found with Smart Polling** checkbox.

Generate PDF	×
You can find the report in the generated report section once it's been generated	
Include installed software found with Smart Polling	
Save	el

4. Select Save.

**Result:** The *portable document format (PDF)* file generates in the background. When it is ready, you can view it on the **Reports** page.

5. To view the report, go to **Reports > Generated**.

# Navigate from an asset

The **Lists** page lets you use hyperlinks to navigate to entities that are related to an asset.

### Procedure

1. In the top navigation bar, select Assets.

Result: The Assets page opens.

- In the Actions column, to the left of the applicable asset, select the ricon.
   Result: A list of related entities shows.
- 3. Select the hyperlink that you want to navigate to.

Go to fe80::14ab:4e17:4c9d:84e9 [Node] Go to mdns [Protocol] Go to fe80::14ab:4e17:4c9d:84e9 / Any / Any [Link] Go to Any / fe80::14ab:4e17:4c9d:84e9 / Any [Link] Go to fe80::14ab:4e17:4c9d:84e9 [Vulnerabilities] Go to fe80::14ab:4e17:4c9d:84e9 / Any [Sessions] Go to Any / fe80::14ab:4e17:4c9d:84e9 / Any [Sessions]

### Results

The entity shows in the applicable page.

# View more details for an asset

Both the Lists and Diagrams pages lets you view more details for a specific asset.

#### Procedure

1. In the top navigation bar, select Assets.

Result: The Assets page opens.

- 2. In the top right section, select either List or Diagram
- 3. Choose a method to view more details for an asset:

#### Choose from:

- If you chose the **List** page, in the **NAME** column for the applicable asset, select the hyperlink
- If you chose the **Diagram** page, below the applicable asset, select the hyperlink

### Results

The Details window (on page 42) for the asset shows.

# Overview

The **Overview** page shows a general overview of information for items such as network statistics and location, protocols, and learning status for the related assets.

Sessions 3 active	Alerts 0 high · 0 med.	Software 0 installed	Installed hotfixes 0 installed	Missing hotfixes 9 missing	Vulnerabilities 156 high - 1099 med.	Variables 0 entries
						± 4 4
	N	etwork Location		Propertie	95	
239.9 MB Retransmis: 285.9 MB 09-19 09:08 14:37 990.0 KB in 30'	sion Links 5 3 last active	Zone Undefined	Subnet VLAN	No propert	ies to display	
		earning status	0			
activity Inbound ( 14:37 – 14:32 – active sessions ac	- tive sessions	Node is fully learned	Asset intelligence not active			
Updated on:	2023-09-11					
Vulnerabilities 1099 <mark>156</mark>	Antivirus -					
	Sessions         3 active           2399 MB         Retransmiss           2859 MB         19,486%           19-19 09:08         19,486%           14:37         990.0 KB ini           14:32         -           active sessions ac         Updated on:           Vulnerabilities         109           109         156	Sessions Alerts 3 active Ohigh-0 med. 233.9 MB Retransmission Links 285.9 MB 19.486% 3 19.39 90.0 KB in last active 30' Activity Inbound Outbound 14.37 active sessions active sessions Updated on: 2023-09-11 Vulnerabilities Antivirus 1039 15 -	Sessions     Alerts     Software       3 active     0 high-0 med.     0 installed       239 MB     Retransmission Links     285 MB     19.486%     3       99-19 09:08     19.486%     3     0 installed       14:37     9900 KB in last active     0 installed     Undefined       4:437       Learning status       active sessions active sessions     Image: Software of the sessions     Node is       Updated on: 2023-09-11     Updated on: 2023-09-11     Vulnerabilities       Vulnerabilities     Antivirus	Sessions     Alerts     Software     Installed hort/xes       3 active     0 high-0 med.     0 installed     0 installed       239 MB     Retransmission Links     285 M8     19.486%     3       99-19 09:08     19.486%     3     0 installed     0 installed       14:37     90:00 KB in last active     0 installed     0 installed     0 installed       Learning status       wettvitty     Inbound     Outbound       14:37     -     -     1       active sessions active sessions     Fully     Asset     intelligence       Updated on: 2023-09-11     Vulnerabilities     Antivirus       10:39     126     -	Sessions     Alerts     Software     Installed hoffwes     Missing hoffwes       3 active     0 high-0 med.     0 installed     0 installed     9 missing       239 MB     Retransmission Links     20     20     Subnet     VLAN       285 MB     19.486%     3       14:37     90.0 KB in last active     20     Undefined     -       14:37     -     -     -       14:37     -     -     -       active sessions     Comes     Asset     Intelligence       14:37     -     -     -       14:37     -     -     -       updated on: 2023-09-11     Updated on: 2023-09-11     -       Vulnerabilities     Antivirus     -       1029     16     -	Sessions     Alerts     Software     Installed hoffwas     Vulnerabilities       3 active     0 high-0 med.     0 installed     9 missing     Vulnerabilities       239 MB     Retransmission Links     10     200     100     100       285 MB     19.486%     3       14:37     900 KB in last active     200     200     100     100       Learning status     Intelligence       active sessions active sessions     100     100     100     100       Updated on: 2023-09-11     Updated on: 2023-09-11     100     100     100       Vulnerabilities     Antivirus     100     100     100

#### Figure 16. Overview tab

#### **Network Stats**

This shows useful statistics for the network activity for the related device.

#### **Network Location**

This shows information for the location for the related device on the network.

#### **Properties**

This shows additional information for the related device.

#### Protocols

This shows information for the different protocols that the related device uses.

#### Learning status

This shows the learning status of the related asset.

#### Security

This shows the security status of the related asset.

# Sessions

The **Sessions** page shows detailed information for communication sessions between devices.

	Overview		Sessions 2 active	0 h	Alerts igh · 0 med.	Software 0 installed	Insta (	alled hotfixes Dinstalled	Missing hotfixes 9 missing	Vulnerabilities 156 high - 1099 med	Variables I. 0 entries	
Pa	ge 1 of 2, 46 e	entries							Expor	t 🗅 Live 💽 📿		
ACTI	STATUS	FROM	то	PROTOC	TRANSPORT PROT	FROM POR	TO PORT	THROUGHP	TRANSFERRED B	TRANSFERRED PAC	FIRST ACTIVITY	LA F
<b>▲</b> *	ACTIVE	172.16.7.11	172.18.252.169	smb	tcp	36542	445	0.0 b/s	1.2 KB	2 pp	10:09:09.669	10:0
♣ † 	ACTIVE	172.18.252.16	9 172.16.36.79	smb	tcp	55330	445	30.3 Kb/s	10.1 MB	63 Kpp	09:02:06.541	10:1
• * •	SYN	172.16.7.11	172.18.252.169	smb	tcp	36044	445	0.0 b/s	1.3 KB	4 pp	10:08:18.106	10:0
♣ † ;+	CLOSED	172.16.7.11	172.18.252.169	smb	tcp	36044	445	0.0 b/s	1.3 KB	4 pp	09:47:19.366	09:
÷ *	CLOSED	172.16.7.11	172.18.252.165	smb	tcp	35894	445	0.0 b/s	1.7 KB	8 pp	09:51:27.466	09:
♣ † ;+	CLOSED	172.16.7.11	172.18.252.169	smb	tcp	35636	139	0.0 b/s	66.0 B	1 pp	09:49:11.662	09:

#### Figure 17. Sessions tab

### Export

The **Export**  $\stackrel{(\uparrow)}{\square}$  icon lets you export the current list in either CSV or Microsoft Excel format.

# Live / refresh

The Live  $\bigcirc$  icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

### **Column selection**

# Alerts

The **Alerts** page shows detailed information for all the alerts that have been raised for the related assets.

Overview	Session 5 activ	ns e	0 hig	Alerts h · 0 med.	5	Software	Installed hotfixes 0 installed	M	lissing hotfixes 0 missing	Vu 698 h	Inerabilities high - 389 me	V d. (	ariables ) entries
Alerts Page 1 of 1, 0	entries								Export 📋	т	Live 💽 🤇	● 14 si	elected 🕶
ACTIONS	TIME H • • • •		TYPE ID	STATUS	NAME		DESCRIPTION	RISK	PROTOCOL	IP SRC	IP DST	SRC ROLE	DST ROLE

### Figure 18. Alerts tab

### Export

The **Export** (1) icon lets you export the current list in either CSV or Microsoft Excel format.

### Live / refresh

The **Live** icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

### **Column selection**

# Software

The **Software** page shows a list of software applications that are installed on the related assets.

Overview	Sessions	Alerts	Software	Installed hotfixes	Missing hotfixes	Vulnerabilities	Variables
	5 active	0 high · 0 med.	0 installed	0 installed	0 missing	698 high - 389 med.	0 entries
No data							

Figure 19. Software tab

# Installed hotfixes

The **Installed hotfixes** page shows a list of hotfixes that are installed on the related assets.

Overview	Sessions	Alerts	Software	Installed hotfixes	Missing hotfixes	Vulnerabilities	Variables
	5 active	0 high - 0 med.	0 installed	0 installed	0 missing	698 high - 389 med.	0 entries
No data							

Figure 20. Installed hotfixes tab

# **Missing hotfixes**

The **Missing hotfixes** page shows a list of hotfixes that could be installed on the related assets to resolve the related vulnerabilities.

Overview	Sessions 2 active	Al 0 high	erts • 0 med.	Software 0 installed	Inst	alled hotfixes 0 installed	Missing h 9 miss	otfixes ing	Vulnerabilitie: 156 high · 1099 m	s V ed.	/ariables 0 entries
Page 1 of 1, 9 entries								Live •	🕖 👁 Node	, Missing Patc	h, CVEs 🔻
NODE MISSING PATC											
172.18.252.169 KB5029318	CVE-2018-8271	CVE-2018-8320	CVE-2018-8330	CVE-2018-8332	CVE-2018-8333	CVE-2018-8392	CVE-2018-8393	CVE-2018-8407	CVE-2018-8408	CVE-2018-8411	CVE-2018-8420
172.18.252.169 KB5029259	CVE-2016-0143	CVE-2017-11830	CVE-2017-11831	CVE-2017-11842	CVE-2017-11849	CVE-2017-11850	CVE-2017-11851	CVE-2017-11853	CVE-2017-11880	CVE-2017-11885	CVE-2017-11899
172.18.252.169 KB5029247	CVE-2018-8454	CVE-2018-8492	CVE-2018-8497	CVE-2018-8506	CVE-2018-8547	CVE-2018-8612	CVE-2018-8626	CVE-2019-0551	CVE-2019-0553	CVE-2019-0637	CVE-2019-0682
172.18.252.169 KB5029312	CVE-2018-8455	CVE-2019-1060	CVE-2019-1311	CVE-2019-1325 C	VE-2019-1334 C	/E-2019-1343 CV	E-2019-1347 CVI	<u></u>	E-2019-1381 CVE-	2019-1382 CVE	-2019-1422 CVE-20
172.18.252.169 KB5010345	CVE-2018-0743	CVE-2018-0745	CVE-2018-0809	CVE-2018-0823	CVE-2018-0827	CVE-2018-0843	CVE-2018-0964	CVE-2018-103	5 CVE-2018-8121	CVE-2018-8140	CVE-2018-8141 C
172.18.252.169 KB4532820	CVE-2019-1316										
172.18.252.169 KB5029242	CVE-2018-0826	CVE-2018-0831	CVE-2018-0877	CVE-2018-0880	CVE-2018-0890	CVE-2018-0926	CVE-2018-0961	CVE-2018-096	3 CVE-2018-0982	CVE-2018-098	3 CVE-2018-8142
172.18.252.169 KB5029332	CVE-2019-0887	CVE-2020-0655									
172.18.252.169 KB5006672	CVE-2018-8566										

#### Figure 21. Missing hotfixes tab

### Live / refresh

The Live  $\bigcirc \bigcirc \bigcirc \bigcirc$  icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

#### **Column selection**

# **Vulnerabilities**

The **Vulnerabilities** page shows a list of vulnerabilities that are present on the related asset.

Ove	rview	Sessions 5 active	Alerts 0 high - 0 me	Software d. 0 installed	Installed hotfixes 0 installed	Missing hotfixes 0 missing	Vulnerabilities 698 high - 389 med.	Variables 0 entries
Page 1	of <b>44, 1089</b> entrie	s/filtered by <b>resolve</b>	d: false 🗙		Export 🖒	Only unresolved	• Live • 🞵	● 12 selected ▼
ACTIONS	CVE	NODE SCOP	RE CWE		CWE NAME		CVE CREATION DATE	DISCOVERY DATE
							нч⊧н	н 🗤 н
- B	CVE-2019-13659	172.16.44.216	4.3 20	Improper Input Validation			2019-11-25 16:15:00.000	2023-09-11 12:19:41.251
- B	CVE-2019-13660	172.16.44.216	5.3 20	Improper Input Validation			2019-11-25 16:15:00.000	2023-09-11 12:19:41.252
- B	CVE-2019-13661	172.16.44.216	4.3 20	Improper Input Validation			2019-11-25 16:15:00.000	2023-09-11 12:19:41.253
□ <b>₿</b>	CVE-2019-13662	172.16.44.216	6.5 276	Incorrect Default Permissions			2019-11-25 16:15:00.000	2023-09-11 12:19:41.254
- B	CVE-2019-13663	172.16.44.216	4.3 20	Improper Input Validation			2019-11-25 16:15:00.000	2023-09-11 12:19:41.255
- B	CVE-2019-13664	172.16.44.216	6.5 346	Origin Validation Error			2019-11-25 16:15:00.000	2023-09-11 12:19:41.256
- B	CVE-2019-13665	172.16.44.216	6.5 732	Incorrect Permission Assignmen	t for Critical Resource		2019-11-25 16:15:00.000	2023-09-11 12:19:41.257
- B	CVE-2019-13666	172.16.44.216	7,4 203	Observable Discrepancy			2019-11-25 16:15:00.000	2023-09-11 12:19:41.258
- B	CVE-2019-13668	172.16.44.216	7,4 281	Improper Preservation of Permis	sions		2019-11-25 16:15:00.000	2023-09-11 12:19:41.259

Figure 22. Vulnerabilities tab

### Export

The **Export** (1) icon lets you export the current list in either CSV or Microsoft Excel format.

### Only unresolved

The **Only unresolved** toggle lets you filter the column to only show unresolved vulnerabilities.

### Live / refresh

The Live  $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$  icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

### **Column selection**

# Variables

The **Variables** page shows detailed information for the variables hosted by the related asset.

Overview	Sessions 5 active	Alerts 0 high · 0 med.	Software 0 installed	Installed hotfixes 0 installed	Missing hotfixes 0 missing	Vulnerabilities 698 high - 389 med.	Variables 0 entries
Page 1 of 1, 0 entries					Export		● 14 selected ▼
There are no variables							

### Figure 23. Variables tab

### Export

The **Export**  $\stackrel{(\uparrow)}{\square}$  icon lets you export the current list in either CSV or Microsoft Excel format.

# Live / refresh

The Live  $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$  icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

### **Column selection**



# **Chapter 5. Queries**

5 - Queries



You can use the Nozomi Networks Query Language (N2QL) syntax to create complex data processes to obtain, filter, and analyze lists of information from the Nozomi Networks software.

In Nozomi Networks Query Language (N2QL), queries consist of:

- Data sources (on page 61)
- Commands (on page 66)
- Functions (on page 74)

#### **Data sources**

Queries start by calling a data source. For example:

```
nodes | sort received.bytes desc | head
```

This query will show, in table format, the first 10 nodes that received the most bytes. If you add the pie command at the end of the query, the results will show in a pie chart format, where each slice has node id as the label and the received.bytes field as data.

For example:

```
nodes | sort received.bytes desc | head | pie ip received.bytes
```



#### Figure 24. Queries example

#### **Functions**

You might not achieved your desired result just using queries. Consequently, query syntax supports functions. With functions, you can apply calculations to the fields and use the results as a new temporary field. For example, the query:

```
nodes | sort sum(sent.bytes,received.bytes) desc | column ip
sum(sent.bytes,received.bytes)
```

uses the sum function to sort on the aggregated parameters, which produces a chart with the columns representing the sum of the sent and received bytes.

#### Prefix

The \$ is a prefix that changes the interpretation of the right hand side (rhs) of a where clause. By default, the rhs is interpreted as a string. With the \$ prefix, the interpretation of the rhs changes to a field name.

#### 5 - Queries

For example, in a query such as:

nodes | where id == 17.179.252.2

the right side of the == is expected to be a constant. If you create a query such as:

nodes | where id == id

the query tries to match all of the nodes having id equal to the string id. If, however, you use the \$, the second field is interpreted as a field, not a constant:

nodes | where id == \$id

and returns the full list of records.

# Data sources

These are the available data sources with which you can start a query.

alerts	Raised events
appliances	Downstream connected sensors synchronizing data to this, local one
assertions	Assertions saved by the users. An assertion represents an automatic check against other query sources
assets	Identified assets. Assets represent a local (private), physical system to care about, and can be composed of one or more Nodes. Broadcast nodes, grouped nodes, internet nodes, and similar cannot be Assets accordingly
audit_log	System's log for important operational events, e.g., login, backup creation, etc.
captured_files	Files reconstructed for analysis
captured_logs	Logs captured passively over the network
captured_urls	URLs and other protocol calls captured over the network. Access to files, requests to DNS, requested URLs and other are available in this query source
cpe_items	CPE maps definitions
cve_files	CVE definitions
dhcp_leases	IP to Mac bindings due to the presence of DHCP
function_codes	Protocols' function codes used in the environment
health_log	System's Health-related events, e.g. high resource utilization or hardware-related issues or events
link_events	Events that can occur on a Link, like it being available or not
links	Identified links, defined as directional one-to-one associations with a single protocol (i.e. source, destination, protocol)
microsoft_hotfixes	Microsoft hotfix information

node_cpe_changes	Common Platform Enumeration changes identified over known nodes. On the event of update of a CPE (on hardware, operating system and software versions), an entry in this query source is created to keep track of software updates or better detection of software
node_cpes	Common Platform Enumeration identified on nodes (hardware, operating system and software versions)
node_cves	Common Vulnerability Exposures: vulnerabilities associated to identified nodes' CPEs
node_points	Data points extracted over time, via Smart Polling or via Arc, from monitored Nodes
node_points_last	node_points last samples per each included data point
nodes	Identified nodes, where a node is an L2 or L3 (and above) entity able to speak some protocol
packet_rules	Packet rules definitions
protocol_connections	Identified protocol handhsakes/connections needed to decode process variables
report_files	Generated report files available for consultation
report_folders	Generated report folders
sessions	Sessions with recent network actvity. A Session is a specific application-level connection between nodes. A Link can hold one or more Session at a given time
sessions_history	Archived sessions
sigma_rules	Sigma rules definitions
sp_executions	Executions of Smart Polling plans
sp_node_executions	Results of Smart Polling plans executions per node
stix_indicators	STIX definitions
subnets	Identified network subnets
threat_models	Threat Modeling definitions
trace_requests	Trace requests in processing

variable_history	Process variables' history of values
variables	Identified process variables
yara_rules	YARA rules definitions
zone_links	A list of protocols exchanged by the defined zones
zones	Defined network zones

# **Basic operators**

Operator	(pipe, AND logical operator)
Description	Add a where clause with a logical AND, append it using the pipe character ( ). For example, the query below returns links that are from 192.168.254.0/ 24 AND going to 172.217.168.0/24.
Example	links   where from in_subnet? 192.168.254.0/24   where to in_subnet? 172.217.168.0/24

Operator	OR
Description	To add a where clause with a logical OR, append it using the OR operator. For example, the query below returns links with either the http or the https protocols.
Example	links   where protocol == http OR protocol == https

Example	nodes   where ip !in_subnet? 192.168.254.0/24   count
Description	Put an exclamation point (!) before a term to negate it. For example, the query below returns links that do NOT (!) belong to 192.168.254.0/24.
Operator	! (exclamation point, NOT logical operator)

Operator	->
Description	To change a column name, select it and use the -> operator followed by the new name. It is worth noting that specific suffixes are parsed and used to visualize the column content differently. For example: • _time data is shown in a timestamp format (1647590986549 becomes 2022-03-18 09:09:46.549) • _bytes adds KB or MB, as applicable (50 becomes 50.0 B) • _percent adds a percentage sign (50 becomes 50%) • _speed adds a throughput speed in Mb/s (189915 becomes 1.8 Mb/s) • _date converts numbers into a date format (2022-06-22 15:43:31.297 becomes 2022-06-2214:24:09.280 becomes 2022-06-24 (current day)) • _packets adds pp after the number of packets (50 becomes 50 pp)
Example 1	<pre>nodes   select created_at created_at-&gt;my_integer   where my_integer &gt; 946684800000</pre>
Example 2	nodes   select created_at->my_creation_time

Example 3	nodes   select tcp_retransmission.bytes->my_retrans_bytes
Operators	==, =, <, >, <=, and >=
Description	Queries support the mathematical operators listed above.
Operator	" (Quotation marks)
Description	<ul> <li>Use quotation marks (") to specify an empty string. Consider these two cases where this technique is useful:</li> <li>Finding non-empty values. Example 1 below returns assets where the os field is not blank.</li> <li>Specifying that a value in the query is a string (if its type is ambiguous). Example 2 below tells concat to treat the "" parameter as a fixed string to use rather than as a field from the alerts table.</li> </ul>
Example 1	assets   where os != ""
Example 2	alerts   select concat(id_src,"",id_dst)

Operator	in?
Description	in? is only used with arrays; the field type must be an array. The query looks for the text strings you specify using in? and returns arrays that match one of them. The example below uses in? to find any node having computer or printer as elements in the array.
Example	assets   where type in? ["computer","printer_scanner"]

Operator	include?
Description	The query looks for the text string you specify using include? and returns strings that match it. The example below uses include? to find assets where the <b>os</b> field contains the string <b>Win</b> .
Example	assets   where os include? Win

# Commands

Syntax	select <field1> <field2> <fieldn></fieldn></field2></field1>
Parameters	• the list of field(s) to output
Description	The select command takes all the input items and outputs them with only the selected fields

Syntax	exclude <field1> <field2> <fieldn></fieldn></field2></field1>
Parameters	• the list of field(s) to remove from the output
Description	The exclude command takes all the input items and outputs them without the specified field(s)

Syntax	where <field> &lt;== != &lt; &gt; &lt;= &gt;= in? include? start_with? end_with?  in_subnet?&gt; <value></value></field>
Parameters	<ul> <li>field: the name of the field to which the operator will be applied</li> <li>operator</li> <li>value: the value used for the comparison. It can be a number, a string, or other data type. Advanced operators can use other data types, such as: <ul> <li>a list (using JSON syntax) when using the in? operator, for example: nodes   where ip in? ["172.18.41.44"]</li> <li>another property when using the '\$' symbol, for example: nodes   where ip != \$id</li> </ul> </li> </ul>
Description	The where command will send to the output only the items which fulfill the specified criterion, many clauses can be concatenated using the boolean <b>OR</b> operator
Example	<ul> <li>nodes   where roles include? consumer OR zone == office</li> <li>nodes   where ip in_subnet? 192.168.1.0/24</li> <li><value> can also be another <field>, as in: links   where from_zone == \$to_zone   select from_zone to_zone</field></value></li> </ul>

Syntax	sort <field> [asc desc]</field>
Parameters	<ul> <li>field: the field used for sorting</li> <li>asc desc: the sorting direction</li> </ul>

Description	The sort command will sort all the items according to the field and the direction specified, it automatically understands if the field is a number or a string
Syntax	group_by <field> [ [avg sum] [field2] ]</field>
Parameters	<ul> <li>field: the field used for grouping</li> <li>avg sum: if specified, the relative operation will be applied on field2</li> </ul>
Description	The group_by command will output a grouping of the items using the field value. By default the output will be the count of the occurrences of distinct values. If an operator and a <b>field2</b> are specified, the output will be the average or the sum of the <b>field2</b> values
Syntax	head [count]
Parameters	• count: the number of items to output
Description	The head command will take the first <b>count</b> items, if <b>count</b> is not specified the default is 10
Syntax	uniq [ <field1> <field2> <fieldn>]</fieldn></field2></field1>
Parameters	• an optional list of fields on which to calculate the uniqueness
Description	The uniq command will remove from the output the duplicated items
Syntax	expand <field></field>
Parameters	• field: the field containing the list of values to be expanded
Description	The expand command will take the list of values contained in <b>field</b> and for each of them it will duplicate the original item substituting the original <b>field</b> value with the current value of the iteration
Syntax	expand_recursive <field></field>
Parameters	• field: the field to be recursively expanded

Description	The expand_recursive command will recursively parse the content of <b>field</b> expanding each array or ison structure until a scalar value is found
	It generates a new row for each array element or json field. For each new row, it duplicates the original item substituting the original <b>field</b>
	value with the current value of the iteration and adding a new field that represents the current iteration path from the root

Syntax	sub <field></field>
Parameters	• field: the field containing the list of objects
Description	The sub command will output the items contained in <b>field</b>

Syntax	count
Parameters	
Description	The count command outputs the number of items

Syntax	pie <label_field> <value_field></value_field></label_field>
Parameters	<ul> <li>label_field: the field used for each slice label</li> <li>value_field: the field used for the value of the slice, must be a numeric field</li> </ul>
Description	The pie command will output a pie chart according to the specified parameters

Syntax	column <label_field> <value_field></value_field></label_field>
Parameters	<ul> <li>label_field: the field used for each column label</li> <li>value_field: one or more field used for the values of the columns</li> </ul>
Description	The column command will output a histogram; for each label a group of columns is displayed with the value from the specified value_field(s). The variant column_colored_by_label returns bars of different colors depending on their labels.

Syntax	history <count_field> <time_field></time_field></count_field>
Parameters	<ul> <li>count_field: the field used to draw the Y value</li> <li>time_field: the field used to draw the X points of the time series</li> </ul>

Description	The history command will draw a chart representing an historic series of values
Syntax	distance <id_field> <distance_field></distance_field></id_field>
Parameters	<ul> <li>id_field: the field used to tag the resulting distances.</li> <li>distance_field: the field on which distances are computed among entries.</li> </ul>
Description	The distance command calculates a series of distances (that is, differences) from the original series of distance_field. Each distance value is calculated as the difference between a value and its subsequent occurrence, and tagged using the id_field. For example, assuming we're working with an id and a time field, entering alerts   distance id time returns a table where each distance entry is characterised by the from_id, to_id, and time_distance fields that represent time differences between the selected alerts.

Syntax	bucket <field> <range></range></field>
Parameters	<ul> <li>field: the field on which the buckets are calculated</li> <li>range: the range of tolerance in which values are grouped</li> </ul>
Description	The bucket command will group data in different buckets, different records will be put in the same bucket when the values fall in the same multiple of <range></range>

Syntax	join <other_source> <field> <other_source_field></other_source_field></field></other_source>
Parameters	<ul> <li>other_source: the name of the other data source</li> <li>field: the field of the original source used to match the object to join</li> <li>other_source_field: the field of the other data source used to match the object to join</li> </ul>
Description	The join command will take two records and will join them in one record when <field> and <other_source_field> have the same value</other_source_field></field>

Syntax	gauge <field> [min] [max]</field>
Parameters	<ul> <li>field: the value to draw</li> <li>min: the minimum value to put on the gauge scale</li> <li>max: the maximum value to put on the gauge scale</li> </ul>
Description	The gauge command will take a value and represent it in a graphical way

Syntax	value <field></field>
Parameters	• field: the value to draw
Description	The value command will take a value and represent it in a textual way

Syntax	reduce <field> [sum avg]</field>
Parameters	<ul> <li>field: the field on which the reduction will be performed</li> <li>sum or avg: the reduce operation to perform, it is sum if not specified</li> </ul>
Description	The reduce command will take a series of values and calculate a single value

Syntax	size()
Parameters	• field: the field to calculate the size of
Description	If the field is an array, then the size function returns the number of entries in the array. If the field contains a string, then the size function returns the number of characters in the string. <b>Note</b> : The size function may only be used on the following data sources: alerts, assets, captured_files, links, nodes, packet_rules, sessions, stix_indicators, subnets, variables, yara_rules, zones, and zone_links.
Example:	assets   where size(ip) > 1

# Nodes-specific commands reference

Syntax	<pre>where_node <field> &lt; == != &lt; &gt; &lt;= in? include? exclude?  start_with? end_with? &gt; <value></value></field></pre>
Parameters	<ul> <li>field: the name of the field to which the operator will be applied</li> <li>operator</li> <li>value: the value used for the comparison. It can be a number, a string or a list (using JSON syntax), the query engine will understand the semantics.</li> </ul>
Description	The where_node command will send to the output only the items which fulfill the specified criterion, many clauses can be concatenated using the boolean <b>OR</b> operator. The where_node command is similar to the where command, but the output will also include all the nodes that are communicating directly with the result of the search. <b>Note</b> : This command is only applicable to the nodes table.

Syntax	<pre>where_link <field> &lt; == != &lt; &gt; &lt;= &gt;= in? include? exclude?  start_with? end_with? &gt; <value></value></field></pre>
Parameters	<ul> <li>field: the name of the links table's field to which the operator will be applied.</li> <li>operator</li> <li>value: the value used for the comparison. It can be a number, a string or a list (using JSON syntax) the query engine will understand the semantics.</li> </ul>
Description	The where_link command will send to the output only the nodes which are connected by a link fulfilling the specified criterion. Many clauses can be concatenated using the boolean <b>OR</b> operator. <b>Note</b> : This command is only applicable to the nodes table.
Syntax	<pre>graph [node_label:<node_field>] [node_perspective:<perspective_name>] [link_perspective:<perspective_name>]</perspective_name></perspective_name></node_field></pre>

Parameters	<ul> <li>node_label: add a label to the node, the label will be the content of the specified node field</li> <li>node_perspective: apply the specified node perspective to the resulting graph. Valid node perspective values are: <ul> <li>roles</li> <li>zones</li> <li>transferred_bytes</li> <li>not_learned</li> <li>public_nodes</li> <li>reputation</li> <li>appliance_host</li> </ul> </li> <li>link_perspective: apply the specified link perspective to the resulting graph. Valid link perspectives are: <ul> <li>transferred_bytes</li> <li>tcp_firewalled</li> <li>tcp_handshaked_connections</li> <li>tcp_retransmitted_bytes</li> <li>throughput</li> <li>interzones</li> <li>not_learned</li> </ul> </li> </ul>
Description	The graph command renders a network graph by taking some nodes as input.
# Link-events-specific commands reference

Syntax	availability
Parameters	
Description	The availability command computes the percentage of time a link is UP. The computation is based on the link events UP and DOWN that are seen for the link.
Syntax	
Syntax	availability_history <range></range>
Parameters	• range: the temporal window in milliseconds to use to group the link events
Description	The availability_history command computes the percentage of time a link is UP by grouping the link events into many buckets. Each bucket will include the events of the temporal window specified by the range parameter.
Syntax	availability_history_month <months_back> <range></range></months_back>

Syntax	availability_history_month <months_back> <range></range></months_back>
Parameters	<ul> <li>months_back: number of months to go back in regards to the current month to group the link events</li> <li>range: the temporal window in seconds to use to group the link events</li> </ul>
Description	The availability_history command computes the percentage of time a link is UP by grouping the link events into many buckets. Each bucket will include the events of the temporal window specified by the range and months parameters.

# **Functions**

Functions are always used in conjunction with other commands, such as select. In the following examples, functions are shown in **bold**:

- Combining functions with select: nodes | select id type **color**(type)
- Combining functions with where: nodes | where **size**(label) > 10
- Combining functions with group\_by: nodes | group\_by **size**(protocols)

Here is the complete list of functions:

Syntax	abs( <field>)</field>
Parameters	• the field on which to calculate the absolute value
Description	The abs function returns the absolute value of the field
Syntax	<pre>bitwise_and(<numeric_field>,<mask>)</mask></numeric_field></pre>

Parameters	<ul> <li>numeric_field: the numeric field on which apply the mask</li> <li>mask: a number that will be interpreted as a bit mask</li> </ul>
Description	The bitwise_and function calculates the bitwise & operator between the numeric_field and the mask entered by the user

Syntax	<pre>coalesce(<field1>,<field2>,)</field2></field1></pre>
Parameters	• a list of fields or string literals in the format " <chars>"</chars>
Description	The coalesce function will output the first value that is not null

Syntax	<pre>color(<field>)</field></pre>
Parameters	• field: the field on which to calculate the color
Description	The color function generates a color in the rgb hex format from a value
Note	Only available for nodes, links, variables and function_codes

Syntax	<pre>concat(<field1>,<field2>,)</field2></field1></pre>
Parameters	• a list of fields or string literals in the format " <chars>"</chars>

Description	The concat function will output the concatenation of the input fields or values
Syntax	<pre>date(<time>)</time></pre>
Parameters	• time defined as unix epoch
Description	The date function returns a date from a raw time

Syntax	<pre>day_hour(<time_field>)</time_field></pre>
Parameters	<ul> <li>time_field: the field representing a time</li> </ul>
Description	The day_hour function returns the hour of the day plus the sensor's local time offset from UTC, i.e. a value in the range 0 through 23. Be careful when accounting for daylight saving time. Use <b>day_hour_utc</b> when absolute precision is desired

Syntax	<pre>day_hour_utc(<time_field>)</time_field></pre>
Parameters	<ul> <li>time_field: the field representing a time</li> </ul>
Description	The <b>day_hour_utc</b> function returns the hour of the day expressed in UTC for the current time field, i.e. a value in the range 0 through 23

Syntax	<pre>days_ago(<time_field>)</time_field></pre>
Parameters	<ul> <li>time_field: the field representing a time</li> </ul>
Description	The days_ago function returns the amount of days passed between the current time and the time field value
Syntax	   dist( <field1>.<field2>)</field2></field1>

Syntax	
Parameters	• the two fields to compute the distance on
Description	The dist function returns the distance between field1 and field2, which is the absolute value of their difference
Syntax	<pre>div(<fieldl>,<field2>)</field2></fieldl></pre>

Parameters	• field1 and field2: the two field to divide					
Description	The div function will calculate the division field1/field2					
Syntax	hours_ago( <time_field>)</time_field>					
Parameters	• time_field: the field representing a time					
Description	The hours_ago function returns the amount of hours passed between the current time and the time field value					

Syntax	is_empty(field) == true   false
Parameters	• field: the field to check to evaluate whether it is empty or not
Description	The is_empty command takes a field as input and returns only the entries that are either empty / not empty.
Example	nodes   where is_empty(label) == false

Syntax	<pre>is_recent(<time_field>)</time_field></pre>
Parameters	<ul> <li>time_field: the field representing a time</li> </ul>
Description	The is_recent function takes a time field and returns true if the time is not farther than 30 minutes

Syntax	<pre>minutes_ago(<time_field>)</time_field></pre>
Parameters	<ul> <li>time_field: the field representing a time</li> </ul>
Description	The minutes_ago function returns the amount of minutes passed between the current time and the time field value

Syntax	<pre>mult(<field1>,<field2>,)</field2></field1></pre>
Parameters	• a list of fields to multiply
Description	The mult function returns the product of the fields passed as arguments
Syntax	<pre>round(<field>,[precision])</field></pre>

Parameters	<ul> <li>field: the numeric field to round</li> <li>precision: the number of decimal places</li> </ul>						
Description	The round function takes a number and outputs the rounded value						
Syntax	<pre>seconds_ago(<time_field>)</time_field></pre>						
Parameters	<ul> <li>time_field: the field representing a time</li> </ul>						
Description	The seconds_ago function returns the amount of seconds passed between the current time and the time field value						
Syntax	<pre>split(<field>,<splitter>,<index>)</index></splitter></field></pre>						
Parameters	<ul> <li>field: the field to split</li> <li>splitter: the character used to separate the string and produce the tokens</li> <li>index: the 0 based index of the token to output</li> </ul>						
Description	The split function takes a string, separates it and outputs the token at the <index> position</index>						
Syntax	<pre>sum(<field>,)</field></pre>						
Parameters	• a list of fields to sum						
Description	The sum function returns the sum of the fields passed as arguments						

# Examples

### **Pie chart**

An example on how to create a pie chart to understand the media access control (MAC) vendor distribution in a network.

We choose nodes as our query source and we start to group the nodes by mac\_vendor:

nodes | group\_by mac\_vendor

We can see the list of the vendors in our network associated with the occurrences count. To better understand our data we can use the sort command, so the query becomes:

nodes | group\_by mac\_vendor | sort count desc

In the last step we use the pie command to draw the chart with the mac\_vendor as a label and the count as the value.

```
nodes | group_by mac_vendor | sort count desc | pie mac_vendor count
```



#### Figure 25. Pie chart example

### **Column chart**

An example on how to create a column chart with the top nodes by traffic.

To start, you need to get the nodes and select the:

- id
- sent.bytes
- received.bytes
- sent.bytes
- received.bytes

To calculate the sum , you need to use the sum function. The query is:

nodes | select id sent.bytes received.bytes
sum(sent.bytes,received.bytes)

When you execute this query, the sum field has a very long name. You can rename it to be more comfortable with these commands:

```
nodes | select id sent.bytes received.bytes
sum(sent.bytes,received.bytes)->sum
```

To obtain the top nodes by traffic, you can sort and take the first 10:

```
nodes | select id sent.bytes received.bytes
sum(sent.bytes,received.bytes)->sum | sort sum desc | head 10
```

Finally, to display the data in a graphical way, you can use the column command:

```
nodes | select id sent.bytes received.bytes
sum(sent.bytes,received.bytes)->sum | sort sum desc | head 10 | column
id sum sent_bytes received_bytes
```

#### Note:

You can access an inner field of a complex type with the dot syntax, in the example the dot syntax is used on the fields sent and received to access their bytes sub field.



After accessing a field with the dot syntax, it will gain a new name to avoid ambiguity; the dot is replaced by an underscore. In the example sent.bytes become sent\_bytes



#### Figure 26. Column chart example

### Where with multiple conditions in OR

An example of a query to get all the nodes with a specific role, in particular all the nodes which are web or domain name server (DNS) servers.

With the where command, you can separate many conditions with OR

#### Note:

Because the roles field contains a list of values, you can use the include? operator to check if a value was contained in the list.

es	where	roles	include?	web_server	OR role	es include?	dns_se	erver
lect	id rol	es						
න nod	es   where roles includ	e? web_server OR ro	oles include? dns_server   sele	ict id roles				
nod Result (node	es   where roles includ	e? web_server OR ro	oles include? dns_server   sele nclude? dns_server   select id rol	ct id roles		C To assertion	D Excel @ CSV	Auto 3 E
ා nod Result (node id	es   where roles includ	e? web_server OR ro web_server OR roles in	oles include? dns_server   sele nclude? dns_server   select id roli	nct id roles	roles	C <sup>o</sup> To assertion	Excel @ CSV	Auto 3 E
nod Result (node id 192.168.1.1	es   where roles include is   where roles include? JSON View ["dns_serve	e? web_server OR ro web_server OR roles in	oles include? dns_server   sele nclude? dns_server   select id rol	ct id roles	roles	Cf To assertion	Excel @ CSV	Auto C 5

Figure 27. Where with multiple conditions in OR example

### **Bucket and history**

An example of a query to calculate the distribution of link events towards an internet protocol (IP) address.

You can filter all the link\_events with id\_dst equal to 192.168.1.11 After this you can sort by time, this is a very important step because bucket and history depend on how the data are sorted.

Then you can use bucket to group the data by time. The final step is to use the history command to draw a chart, we pass count as a value for the Y axis and time for the X axis.

The history command is particularly suited for displaying a big amount of data, in the image below we can see that there are many hours of data to analyze.







### Join

An example query to join two data sources to obtain a new data source with more information. In particular, how to list the links with the labels for the source and destination nodes.

You can match the from field of the links with the id field of the nodes to ask for the links, and join them with the nodes:

links | join nodes from id

After executing the query above you will get all the links fields, plus a new field called joined\_node\_from\_id, it contains the node which satisfies the link.from == node.id condition. You can use the dot syntax to access the sub fields of joined\_node\_from\_id

Because we also want to get the labels for the to field of the links you add another join and exclude the empty labels of the node referred by to to get more interesting data:

```
links | join nodes from id | join nodes to id | where
joined_node_to_id.label != ""
```

This will obtain a huge amount of data, which is difficult to understand. To only get the relevant information, you can use a select:

```
links | join nodes from id | join nodes to id | where
joined_node_to_id.label != "" | select from joined_node_from_id.label to
joined_node_to_id.label protocol
```

ື link	Iinks   join nodes from id   join nodes to id   where joined_node_to_id.label != ""   select from joined_node_from_id.label to joined_node_to_id.label protocol									
Result (links	tesuit (links   join nodes from id   join nodes to id   where joined_node_to_id.label 1= ""   select from joined_node_from_id.label to joined_node_to_id.label protocol) 🕃 To assertion 🔯 Excel 🗟 CSV 🛛 Auto 📿 👎									
from	joined_node_from_id_label	to	joined_node_to_id_label	protocol						
172.16.0.253		172.16.0.148	Modicon M340 BMX P34 2020	modbus						
172.16.0.253		172.16.0.149	Modicon M340 BMX P34 2020	modbus						
172.16.1.253		172.16.1.149	Modicon M340 BMX P34 2020	modbus						
172.16.0.253		172.16.0.156	Modicon M340 BMX P34 2020	modbus						
172.16.1.253		172.16.1.156	Modicon M340 BMX P34 2020	modbus						
172.16.0.253		172.16.0.146	Modicon M340 BMX P34 2020	modbus						
172.16.1.253		172.16.1.146	Modicon M340 BMX P34 2020	modbus						
172.16.0.253		172.16.0.153	Modicon M340 BMX P34 2020	modbus						
172.16.1.253		172.16.1.153	Modicon M340 BMX P34 2020	modbus						
172.16.0.253		172.16.0.143	Modicon M340 BMX P34 2020	modbus						

#### Figure 29. Join example

### Compute the availability history

An example query to compute the availability history for a link.

In order to achieve a reliable availability, it is recommended to enable the **Track availability** feature on the desired link.

Start from the link\_events data source, filtered by source and destination ip in order to precisely identify the target link. Consider also filtering by protocol to achieve a higher degree of precision.

link\_events | where id\_src == 10.254.3.9 | where id\_dst == 172.31.50.2

The next step is to sort the events by ascending time of creation. Without this step the availability\_history might produce meaningless results, such as negative values. Then, to compute the availability\_history with a bucket of 1 minute (60000 milliseconds), you can complete query is as follows:

link\_events | where id\_src == 10.254.3.9 | where id\_dst == 172.31.50.2 |
sort time asc | availability\_history 60000

Queries								
9	link_e	vents   where id_src == 10.254.3.9   where id_dst == 172.31.50.2   sort time as	c   availability_his	tory 60000				
Result	t (link_ev	ents   where id_src == 10.254.3.9   where id_dst == 172.31.50.2   sort time asc   availa	☑ To assertion	🖹 Excel 🗎				
ava	ilability	time						
100		09:01:00.000						
34.075	5	09:02:00.000						
21.411	67	09:04:00.000						
79.805	5	09:05:00.000						
0		09:06:00.000						
74.471	67	09:08:00.000						
25.788	333	09:09:00.000						
0		09:10:00.000						
29.111	67	09:11:00.000						
71.361	67	09:12:00.000						

#### Figure 30. Availability history example

### Note:

By default, link\_events generation is disabled. To enable it, you can use the configuration rule described in **Configure links**.

### **Complex field types**

#### Single scalar values

To query single scalar values, apply the commands that are explained in this section.

#### **Objects**

Objects show in braces: {object}

```
{
"source": "ARP",
"likelihood": 1,
"likelihood_level": "confirmed"
}
```

An example on how to query only confirmed MAC addresses.



Since mac\_address: info is an object, you can access subfields like mac\_address: info.likelihood\_level to apply the where condition:

```
nodes | select mac_address:info mac_address:info.likelihood_level | where
mac_address:info.likelihood_level == confirmed
```

Since N2OS 24.1 is possible to access complex objects with a different syntax that is compatible with Vantage, using the / operator, the query specified above becomes:

```
nodes | select mac_address:info/likelihood_level | where
mac_address:info.likelihood_level == "confirmed"
```

Note that also the "confirmed" literal can now be quoted and the query can be executed in Vantage without any change.

#### Arrays

Г

Note: For example, a parent in the alerts table.

Arrays show in braces: {array}

```
"5b867836-2b41-4c15-ab6f-4ae5f0251e30"
]
```

An example on how to only query alerts that have a parent incident, with a known incident id with the value: d36d0

Since the parents field is an array, you can use expand first to get an entry for each parent, then apply your condition:

alerts | expand parents | where expanded\_parents include? d36d0

#### **Object arrays**

#### Note:

For example, function\_codes in the links table.

Object arrays are a combination of the above examples. Therefore, they show an object included in a [{..},{..]:

```
[
{
"name": "M-SEARCH",
"is_learned": true,
"is_fully_learned": true
}
]
```

An example on how to query learned function codes.

Since function\_codes is an object array, you can use expand first, to get an entry for each function code, then use the . operator (function\_code.is\_learned) to apply your where condition:

links | select from to protocol function\_codes | expand function\_codes |
where expanded\_function\_codes.is\_learned == true

# **Chapter 6. Smart Polling in CMC**



#### The Smart Polling page gives you a read-only view of Smart Polling.

In the *CMC*, Smart Polling plans are read-only. Plans created in Guardian can be synchronized, along with the associated data. By default, synchronization is disabled.

Smart Polling has these tabs:

- Plans (on page 88)
- Node points (on page 89)

### Plans

The **Plans** page shows a list of Smart Polling plans and lets you manage plans and add new ones.

NOZOMI = IN Sensors 🔿 Alerts 📿 Assets	Queries 🗞 Smart Polling	\$ \$
Smart Polling	Plans	Node points
32 configured plans Filter by node ID		Live • 5
◎ > Progressive: EthernetIP	from "ch-lab-sg-nsl-lintra.nozominetworks.com" ("25379df7-44lc-4482-9al2-122d86el2683") Ø5 hours ago 56 Nodes	
৩ → Progressive: MELSOFT	from "ch-lab-sg-nsi-Lintra.nozominetworks.com" ("25379df7-44lc-4482-9al2-122d86el2683") Ø5 hours ago 75 Nodes	
Progressive: Modicon Modbus	from "ch-lab-sg-nsl-1 intra.nozominetworks.com" ("25379df7-44)c-4482-9a12-122d86e12683") © 5 hours ago 49 Nodes	
> Progressive: S7	from "ch-lab-sg-nsl-Lintra.nozominetworks.com" ("25379d17-44lc-4482-9a12-122d86e12683") Ø 5 hours ago 29 Nodes	
ວ > Progressive: Dahua DHIP/DVRIP devices	from "ch-lab-sg-nsl-lintra.nozominetworka.com" ("25379df7-441c-4482-9a12-122d86e12683") Ø 5 hours ago 2 Nodes	

Figure 31. Plans page

#### Filter

The filter field lets you use the node *ID* to filter the page.

### Live / refresh

The Live  $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$  icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

# Node points

The **Node points** page shows all of the node points.

Smart Polling							Plans Node po	oints
1 nodes polled	matching filter:	192.168	.45.212				Live •	3
Nodes			192.16	8.45.212		с	PU0_load	
192.168.45.212	@3 minutes ago							
			Antivirus[0]	Windows Defender	>			
			Antivirus[1]	Kaspersky Anti-Virus	>	4 %	From 13:02:27.615 to Now	
			CPU0 load	4 %	>	3 %	From 02:25:55.545 to 13:02:27.614	
			CPU1 load	0 %	>	2 %	From 2023-03-15	

Figure 32. Node points page

## View the enriched information history for a node

The **Node points** page lets you view the enriched information history for a node.

#### Procedure

1. In the top navigation bar, select **Smart Polling**.

Result: The Smart Polling page opens.

2. In the top right, select **Node points**.

Result: The Node points page opens.

3. In the left column, select a node point.

Smart Polling					Plans Node points S	ettings Health
1 nodes polled	matching filter:	192.168.45.212				Live
Nodes		192	168.45.212		CPU0_load	
192.168.45.212	© 3 minutes ago	Antivirus[(	0] Windows Defender	>		$\checkmark$
		Antivirus[1	] Kaspersky Anti-Virus	>	4% From 13:02:27.6 to Now	515
		CPU0 load	4 %	>	<b>3 %</b> From 02:25:55. to 13:02:27.614	545
		CPU1 load	0 %	>	2 % From 2023-03- 14:36:42 662	15

**Result:** The second and third columns show an increased level of detail for the extracted information for that node point

# **Chapter 7. Arc overview**



**Arc™** is a host-based sensor that detects and defends against malicious or compromised endpoints, and insider attacks. You can use Arc sensors to aggregate data for analysis and reports, either on-premises, or in the Vantage cloud.

#### General

When detecting cyberthreats, identifying vulnerabilities, or analyzing anomalies in your processes, it is critical to have as much detailed network and system information as possible. More accurate and timely access to data leads to better diagnostics and a faster time to repair.

Arc gives you enhanced endpoint data collection and asset visibility for your networks. This enhanced visibility gives you more:

- Vulnerability assessment capabilities
- Endpoint protection
- Traffic analysis capabilities
- Accurate diagnostics of in-progress threats and anomalies

Arc lets you easily identify compromised hosts that have:

- Malware
- Rogue applications
- Unauthorized universal serial bus (USB) devices
- Suspicious user activity

#### **Operating Systems (OS)**

Arc sensors are endpoint executables that run on hosts on these OSs:

- Microsoft Windows
- Linux
- Apple macOS

The data that is collected can be sent to either Guardian or Vantage.

#### Use cases and deployment scenarios

Arc lets you:

- Incorporate air-gapped devices into the analysis and reporting system
- Gain deeper intelligence or insight on critical endpoint devices
- Continuously monitor endpoints
- Automatically deploy sensors across thousands of devices
- Use a low-impact process to scan air-gapped networks
- Deploy with solutions

#### **Continuous monitoring**

Because the Arc sensor is on the host, it can monitor traffic continuously, even when the device is not sending or receiving traffic.

#### User-specific activity monitoring

With more access to endpoint data, Arc lets you connect network traffic and anomalies with specific users. This helps to identify potential insider threats and makes corrective actions both easier and quicker.

#### Local behavioral analysis (Sigma rules)

Sigma is a common open-source standard that lets you analyze log files to identify malicious events. They are not necessarily related to network artifacts, and as such, would not be detected without residing on a machine. Nozomi Networks Labs curates all the Sigma rules that are loaded into Arc. A *Threat Intelligence (TI)* active license is needed to receive curated rules from the upstream Nozomi endpoint.

#### **Temporary deployment**

It is not necessary to keep the Arc executable on a host after you have collected information. This means that you can remove it after data has been collected to conserve host resources, and maintain a clean host environment.

# Architecture

It is important to understand the different architecture possibilities that are available with Arc.

You can connect Arc:

- To Guardian
- To Vantage



#### Figure 33. Arc architecture example

# Arc in CMC

The **Arc** button in the Central Management Console (CMC) Web UI lets you access the different pages for Arc.

	≡	।। । Sensors	Alerts	Assets	V Queries	Smart Polling	ه ه
Arc							Node points
6 nodes polled			Filter	by node ID			Live • Ç5

#### Figure 34. Arc button in CMC Web UI

When you select **Arc** in the *CMC* Web *user interface (UI)*, you get access to the **Node points** page.

# Node points

The **Node points** page shows data points that are collected over time, and represent the state of the target machine.

СМС			^ ¢	LINE HOST		um	TIME	DISK	LICENSEE	UPDA	THET & ALV AND & Impleh +	
NOZOMI					<b>閏 4</b> 10							
Arc												Node points
9 nodes polled		Filter by node ID										1000 🖲 💭
Nodes							10.41.43.55				CPU0_load	
10.41.43.54	Ø a few seconds ago				CDUO lead		16					
10.41.43.55	© a few seconds age				CFOOTON		1.4					
10.41.46.102	Dia fevi seconda ago				Interface[0]	1	ethO		>			
10.41.50.14	© a few seconds ago				Interface[1]		wian0		>	1%	From 12/05/06/349	
10.41.50.17	D in a few seconds				Interface[2]		docker0			15	From 1204:06:28	
10.41.50.23	D in a few seconds										00 12:04:06:291	
10.41332.133	Dia fevi secondi ago				Partition[0]		sysfs		>	1%	From 12:03:06:297 to 12:03:06:297	
					Partition[10	0	cgroup2		>	1%	From 12:02:06:312 to 12:02:06:312	
					Partition[11]	1	cgroup		>	1%	From 1201.06.316 to 12.01.06.316	
					Partition[12]	a	pstore		>	1%	From 12:00:06:291	
					Partition[13]	1	none		>	15	From 1159:06:299	
					Partition[14	1	cgroup		>	15	Exem 1759/06 340	
					Partition[15]	1	cgroup		>		to ILSB.05.349	
					Partition[16	1	cgroup		>	15	From 1157:06.299 to 11:57:06.299	
					Partition[17	n	cgroup		,	1%	From 1156/06/305 to 11.56/06/305	
					Partition[18	0	cgroup		>	1%	From T155.06.368 to T155.06.368	
					Partition[19	1	cgroup		>	1%	From TIS4:06.300 to TIS4:06.300	
					Partition[1]		proc		>	15	From 1153/06.448 to 1153/06.448	
					Partition[20	0]	cgroup		>	2 %	From 115228.359 to 115228.359	
					Partition[2]	a	cgroup		>	1%	From 7157.06.280 to 7157.06.290	

#### Figure 35. Node points page in CMC

#### Node points count

This shows the number of the nodes polled.

#### Filter by node ID

This field lets you use the node *ID* to filter the nodes.

#### Live toggle

The **Live** toggle lets you change live view on, or off. When live mode is on, the page will refresh periodically.

#### Refresh

The  ${\mathfrak O}$  icon lets you immediately refresh the current view.

#### Nodes

The list of nodes that show at least one node point.

# **Chapter 8. Reports**



The **Reports** page lets you manage, generate, schedule and view reports.

	NOZOMI	i 🕂 Alerts	Assets	V Queries	Smart Polling	\$ \$
R	Network				Dashboard Management Generated Sched	uled Settings
Disk	Process				Management	
Avai	C Reports				Report editor permissions: yes	
	- Assertions				Available report templates count: 5 Available widgets count: 48	
Disk	Time machine				Custom queries count: 0	
	Vulnerabilities				Custom reports count: 3	

#### Figure 36. Reports page

The **Reports** page has these tabs:

- Dashboard (on page 100)
- Management (on page 101)
- Generated (on page 104)
- Scheduled (on page 105)
- Settings (on page 106)

# Dashboard

The Dashboard page shows an overview of information related to reports, which includes disk availability, report settings, generated reports, report management, and scheduled reports.

Reports	Dashboard Management Generated Scheduled Settings
Disk	Management
Available disk space: 3.4G / 4.6G 75.0%	Report editor permissions:     yes       Available report templates count:     5       Available widdets count:     48
Disk space used by reports: 204 KB / 1.2G 0.0%	Custom queries count: 0 Custom reports count: 0
Settings SMTP configuration: no Custom report logo: no	
Generated	Scheduled
Cenerated reports count: 1 Last generated reports: FILENAME CREATION DATE (SERVER TIME)  asset_report_craigs-mac-studio_local 2023-09-151229.06.733	Scheduled reports count: 0

#### Figure 37. Dashboard page

#### Disk

This section shows:

- Available disk space
- Disk space used by reports

#### Management

This section shows a summary of information from the Management (on page 101) page.

#### Settings

This section shows a summary of information from the Settings (on page 106) page.

#### Generated

This section shows a summary of information from the Generated (on page 104) page.

#### Scheduled

This section shows a summary of information from the Scheduled (on page 105) page.

### Management

The Management page lets you manage all your reports.



#### Figure 38. Management page

#### New report

This button lets you Create a report (on page 107).

#### Import schema

This button lets you Import a schema (on page 114).

#### **Report list**

This section shows a list of created and saved reports. You can add folders (on page 112) to group the reports in.

#### Add page

This button lets you add a page to the bottom of the current report.

#### Save

This button lets you save the changes to the current report.

#### Edit

This button lets you edit the current report.

#### Delete

This button lets you delete the current report.

#### **Filters**

This button lets you filter the contents of the current report.

Edit filters for report 'Alerts'	×
Filter on assets	
where device_id = yyy	
Filter on alerts	
where id = 1	
Filter on nodes	
where ip = 192.168.1.12	
Filter on node_cpes	
where node_id = 1.1.1.2	
Filter on links	
where protocol = smb	
Filter on node_cves	
where node_id = 192.168.1.12	
Filter on captured_urls	
where url = www.youtube.com	
Filter on captured_logs	
where id_src = 192.168.1.12	
(1) These filters will not work on the widgets: CISControl_7, CISControl_12, Vulnerability scoring overview, Evidences, Vendors, Vulnerability key findings	
Ok Cance	

### Figure 39. Filter dialog

#### Export schema

This button lets you export a schema (on page 115) for the current report in *JavaScript Object Notation (JSON)* format.

### Generate report

The generate report **b** icon lets you generate a report (on page 109) in one of these formats:

- PDF
- CSV
- Microsoft Excel

# Generated

The Generated page lets you view, download, edit, and delete generated reports.

(server time) 🔻

#### Figure 40. Generated page

#### Live / refresh

The Live  $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$  icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

#### **Column selection**

The columns selection  ${}^{ullet}$  icon lets you choose which columns to show or hide.

# Scheduled

The **Scheduled** page lets you view, download, edit, and delete scheduled reports.

NOZC	РМІ =	≡	।≎। Sensors	Alerts	Assets	V Querie	s 🔆 Smart P	olling 🔆 Arc			\$ \$
Reports							Dashboard	Management	Generated	Scheduled 0	Settings
Page 1 of 1, 1 e	entries					_				Live •	● 9 selected ▼
ACTIONS	NA	ME	USER DI	EFINED NAM	QUERY	RECU	RRENCE (SERV E	MAIL RECIPIENTS	CREATED BY	CREATION DATE (SE	REPORT TYPE
080	Vulnerabi	lities	Assets			daily a	t 00:00 ci	raig.halliday@nozo	admin	15:41:38.397	PDF

#### Figure 41. Scheduled page

### Live / refresh

The Live  $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$  icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

#### **Column selection**

The columns selection  ${}^{igodoldsymbol{\Theta}}$  icon lets you choose which columns to show or hide.

# Settings

The **Settings** page lets you change report settings, upload custom logos, and configure simple mail transfer protocol (SMTP) settings.

Reports		Dashboard	Management	Generated	Scheduled	Settings
	Custom logo Report cu:	stom logo not yet uploa	ided.			
	Drop an in	nage here or click to up	load			
	Supported formats: JPG, PNG and GIF, similar	Logo ideal sizes: 360x90	) or bigger. Logo ideal ratio	: 4:1 or		
	SMTP Server					
	<ul> <li>An SMTP server is required to send 'Email recipients' field is set)</li> </ul>	scheduled reports by e	mail at each recurrence (if	the		
	HOST[:PORT]]//D]					
	STARTILS					
	Authentication Mechanism:   PLAIN	LOGIN				
	Username					
	Password					
	Save					

Figure 42. Settings page

#### **Custom logo**

This section lets you upload a custom logo (on page 116) that will show in your reports.

#### SMTP server

If you want to send emails that contain scheduled reports, you need to configure (on page 118) the *simple mail transfer protocol (SMTP)* server settings.

## Create a report

The Management page lets you create a new report.

#### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

- 2. Select Management.
- 3. In the section on the left, select **New report**.

Result: A dialog shows.

4. In the **Name** field, enter a name for the report.

New report	×
Name	
Layout	
Choose a layout 🗸	
Folder	
<uncategorized> -</uncategorized>	
Group visibility	
Choose one or more groups <del>-</del>	
Widget spacing	
20	٢
Ok Ca	ncel

- 5. From the **Layout** dropdown, select a layout for the report.
- 6. From the **Folder** dropdown, select a folder for the report.
- 7. From the **Group visibility** dropdown, select the group(s) that will be able to view the report.

- 8. From the **Widget spacing** dropdown, enter a value.
- 9. Select **Ok**.

### Results

The report has been created.
## Generate a report

You can generate both scheduled, or on-demand, reports, in multiple file formats.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

- 2. Select Management.
- 3. In the section on the left, select the report that you want to generate.
- 4. In the top right, select **Generate Report**.

Result: A dialog shows.

5. In the **Report type** section, choose a format for the report:

Choose from:

- PDF
- CSV
- Excel

Generate Report	х
PDF CSV Excel	
Report execution	
<ul> <li>Include only Alerts following Security Profile [Applies to Alert widgets only]</li> </ul>	
Save	

6. In the **Report execution** section, choose the type of execution:

#### Choose from:

- On-demand
- Scheduled

7. If you chose **On-demand**, select **Save**.

**Result:** The report starts to generate. When the generation is complete, the report will show in the Generated (on page 104) page.

- 8. If you chose **Scheduled**, do the steps below.
  - a. In the **Recurrence (server time)** section, enter the settings that you want.

Generate Report	×
PDF       CSV       Excel         Report execution       On-demand       Scheduled	
Schedule report creation Recurrence (server time) Daily Weekly Monthly Hours O G Minutes O G	
<ol> <li>Schedule occurrences will be relative to server time (current server time: 13:40:14.751 [-2 hours])</li> </ol>	
User defined name Email recipients (comma separated)	
<ul> <li>Include only Alerts following Security Profile [Applies to Alert widgets only]</li> <li>Save</li> <li>Cancel</li> </ul>	
Save	

- b. Optional: In the User defined name field, enter a name for the report.
- c. **Optional:** In the **Email recipients (comma separated)** field, enter the email addresses of the people that you would like to receive the reports.
- d. Optional: If necessary, select the Include only Alerts following Security Profile [Applies to widgets only] checkbox.

### Results

The report has been generated, or scheduled, as applicable.

## Download a report

The Generated page lets you download reports.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

- 2. Select Generated.
- 3. To the left of the applicable report, select the download 🖄 icon. **Result:** The download starts.

### Results

The report has been downloaded to your downloads folder.

## Delete a report

The **Generated** page lets you delete generated reports.

#### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

**Result:** The **Reports** page opens.

- 2. Select Generated.
- 3. To the left of the applicable report, select the download  $\widehat{\amalg}$  icon.

#### Results

The report has been deleted.

## Add a folder

The **Management** page lets you add folders for you to organize your reports.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

- 2. Select Management.
- 3. In the **Reports list** section on the left, select **Add folder**.

Result: A dialog shows.

4. In the **Name** field, enter a name for the folder.

New report folder	×
Name	
Group visibility	
Choose one or more groups -	
Ok Ca	ncel

- 5. From the **Group visibility** dropdown, select the group(s) that will be able to view the reports.
- 6. Select Ok.

### Results

The folder has been added.

## Edit a folder

The Management page lets you delete reports.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

- 2. Select Management.
- 3. In the section on the left, to the right of the applicable folder's name, select the download 🗹 icon.

Result: A dialog shows.

4. Optional:

If necessary, in the **Name** filed, edit the name of the folder.

Edit report folder 'Miscellaneous'	×
Name	
Miscellaneous	
Group visibility guests -	
Ok	ancel

- 5. Optional: If necessary, in the Group visibility filed, edit the visibility of the folder.
- 6. Select Ok.

### Results

The report has been edited.

## Delete a folder

The Management page lets you delete reports.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

- 2. Select Management.
- 3. In the section on the left, to the right of the applicable folder's name, select the download 🗓 icon.

### Results

The report has been deleted.

## Import a schema

The **Management** page lets you import a schema that has previously been exported.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

- 2. Select Management.
- 3. In the section on the left, select Import Schema.
- 4. Select the schema to import.

### Results

The schema has been imported.

## Export a schema

The **Management** page lets you export a schema.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

- 2. Select Management.
- 3. In the top right, select **Export Schema**.

Result: A dialog shows.

4. In the **Export file name** field, enter a name for the schema.

Choose file name	×
Export file name	
reports_2023927	
	Export

5. Select Export.

#### Results

The schema has been exported in *JSON* format.

## Upload a custom logo

You can add a custom logo that will show in your reports.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

2. Select Settings.

Result: The Settings (on page 106) page opens.

3. Choose a method to upload a custom logo:

#### Choose from:

- Drag your image file into the **Drop an image here or click to upload** field
- Click in the Drop an image here or click to upload field
- 4. If you chose the second method, select the correct file to upload.

	Report custom logo not yet uploaded.
	Drop an image here or click to upload
Supported formate	s: JPG, PNG and GIF. Logo ideal sizes: 360x90 or bigger. Logo ideal ratio: 4:1 or

### Note:

Logos should be 360x90 pixels or bigger, with an ideal aspect ratio of 4:1, or similar.

### Note:

Supported formats are:

- graphics interchange format (GIF)
- joint photographic experts group (JPEG)
- portable network graphics (PNG)
- 5. Wait for the file to upload.
- 6. Select Save.

### Results

Your custom logo will now be added to your reports.

## **Configure SMTP settings**

If you want to send emails that contain scheduled reports, you need to configure the simple mail transfer protocol (SMTP) server settings.

#### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

2. Select Settings.

Result: The Settings (on page 106) page opens.

3. In the SMTP Server section, set the toggle to ON.

SMTP Serve	r
() An SMTP se 'Email recip	erver is required to send scheduled reports by email at each recurrence (if the ients' field is set)
ON OFF	
To URI	
HOST[:PORT][/	D]
Sender	
STARTTLS	
STARTTLS	Mechanism: <ul> <li>PLAIN</li> <li>LOGIN</li> </ul>
STARTTLS Authentication Username	Mechanism:   PLAIN  LOGIN
STARTTLS Authentication Username	Mechanism: <ul> <li>PLAIN  <ul> <li>LOGIN</li> </ul> </li> </ul>
STARTTLS Authentication Username Password	Mechanism:   PLAIN  LOGIN
STARTTLS Authentication Username Password	Mechanism:   PLAIN O LOGIN
STARTTLS Authentication Username Password	Mechanism:  PLAIN  LOGIN
STARTTLS Authentication Username Password Save	Mechanism:  PLAIN  LOGIN

- 4. In the **To URI** field, enter the host URI information. For example, HOST[:PORT][/ ID]
- 5. In the **Sender** field, enter the sender identification information.

6. To use encryption, select the **STARTTLS** checkbox.



- 7. To start the authentication process, choose an Authentication Mechanism:
  - Choose from:
    - **PLAIN**
    - LOGIN

Note: The default setting is **PLAIN**.

- 8. If you chose **LOGIN**, enter your credentials.
  - a. In the **Username** field, enter your username.
  - b. In the **Password** field, enter your password.
- 9. Select **Save**.

### Results

Emails for scheduled reports that have email recipients will now be sent at the next scheduled occurrence.

## Filter a report globally

You can filter a report globally, which is the default filter. This lets you use a specific category to apply filters to the entire report.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

2. Select Management.

**Result:** The Management (on page 101) page opens.

3. In the top section, select  $\mathbf{\nabla}$  Filters.

Result: A dialog shows.

4. Select the category on which to filter, then enter your filter query in the related field.

Edit filters for report 'Alerts'	×
Filter on assets	
where device_id = yyy	
Filter on alerts	
where id = 1	
Filter on nodes	
where ip = 192.168.1.12	
Filter on node_cpes	
where node_id = 1.1.1.2	
Filter on links	
where protocol = smb	
Filter on node_cves	
where node_id = 192.168.1.12	
Filter on captured_urls	
where url = www.youtube.com	
Filter on captured_logs	
where id_src = 192.168.1.12	
<ol> <li>These filters will not work on the widgets: CISControl_7, CISControl_12, Vulnerability scoring overview, Evidences, Vendors, Vulnerability key findings</li> </ol>	
Ok Canc	el

5. Select **Ok**.



### Results

The filter(s) has (have) been applied to the report.

## Add a widget to a report

The Management page lets you add widgets to reports.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Reports.

Result: The Reports page opens.

2. Select Management.

Result: The Management (on page 101) page opens.

3. In the **Reports list** section on the left, select the applicable report.

Result: The report opens.

 On the right side of the report, choose the section that you want to add the widget to. Select Add widget.

Result: A dialog shows.

5. In the left pane, choose the type of widget that you want to add.

Add widget			×
General Table Count Graph Combination Query	>	Custom Image Custom text Widget separator	
		Ok	21

6. From the list, select the widget that you want.

### Results

The widget has been added to the report.

## Filter a report with a widget

You can use widgets to filter a report.

### Procedure

1. In the top navigation bar, select  $\blacksquare$  icon > Reports.

Result: The Reports page opens.

2. Select Management.

Result: The Management (on page 101) page opens.

- In the Reports list section on the left, select the applicable report.
   Result: The report opens.
- 4. Find the widget that you would like to use and hover your mouse over it.

**Result:** At the top of the widget, more buttons show.

5. Select **Edit filter**.



6. Select the category on which to filter, then enter your filter query in the related field.



#### 7. Select Ok.

Ì	Note:
	At the bottom of the dialog is a list of widgets on which filters will not
	work.

#### Results

The filter(s) has (have) been applied to the report.

# **Chapter 9. Assertions**



#### The Assertions page shows all the assertions and lets you configure them.

A valid assertion is a normal query with a special command appended at the end. Assertions can be saved in a specific order and can be continuously executed in the system.

Queries are based on the *N2QL*, which you can use to ensure that certain conditions are met on the observed system. An assertion is typically either an empty value, or a specific value. When an unexpected value appears, or when the value is different than the expected, the system alerts the user.

Ŕ		<b>4</b> ¦ ≡	E 🕬 Sen	sors 🔶 Ale	erts 🖵 Assets	V Queries	🔅 Smart Polling	·Ċ. Arc				
	Assertion	5										華Configure
	9 Enter yo	ur query										*
	Live ass	ertions								N	lew group Expo	rt Import
	Page of <b>0</b> , er	tries									@ 13 :	selected 💌
	ACTIONS N	AME F	FAILED SINCE	# FAILURES	PACKET FILTER	CAN SEND ALERT	S IS SECURITY	CAN REQUEST TRACE	ALERT DELAY	ALERT RISK	ALERT TYPE ID	CREATED .

#### Figure 43. Assertions page

#### Configure

This lets you configure the execution interval in seconds.

#### **History button**

This button shows a history of the previous queries that have been entered in the query field.

#### Query field

This field is where you enter your query.

#### **Debug button**

Because assertions with logical operators and brackets can quickly become complex, the debug icon decomposes the query, and executes each part to show intermediate results.

Assertions												뚚 Configur
ງ (links   wher	re protocol ==	telnet   assert_	empty && link	s   where protocol	== iec104   assert_em	pty) && (nodes	where i	is_learned == false	assert_empty	/)		*
Result ((links   v	where proto	col == telnet	assert_em	pty && links   wl	here protocol == ie	c104   assert_i	empty	) && (nodes   wi	nere is_learne	ed == false   a	ssert_empty	())
査 Debug												
			Query			Re	sult		Query	without assertion	on	
ks   where protocol :	== telnet   asser	t_empty				true		links   where protoc	ol == telnet			
ks   where protocol	== iec104   asser	t_empty				false		links   where protoc	:ol == iec104			
ides   where is_learn	ed == false   ass	ert_empty				false		nodes   where is_lea	arned == false			
Live asserti	ions						Curr	rent group: links +	New group E	dit group Delet	e group Expo	ort Import
Page 1 of 1, 1 entr	ies										@ 12 se	elected 🕶
ACTIONS	NAME	FAILED SINC	# FAILURES	PACKET FILTER	CAN SEND ALERTS	IS SECURITY	CAN	REQUEST TRACE	ALERT DELAY	ALERT RISK	CREATED A	
		H 4 P H										

#### Figure 44. Complex assertion being debugged

### New group

This lets you create a group to combine assertions to make viewing and management easier.

### Export

This lets you export assertion groups in *JSON* format.

### Import

This lets you import assertion groups in JSON format.

## Assertion operators

### Table 5. Assertion operators

Operator	Description
assert_all <field> <op> <value></value></op></field>	The assertion is satisfied when each element in the query result set matches the given condition.
assert_any <field> <op> <value></value></op></field>	The assertion is satisfied when at least one element in the query result set matches the given condition.
assert_empty	The assertion is satisfied when the query returns an empty result set.
assert_not_empty	The assertion is satisfied when the query returns a non-empty result set.

## Save an assertion

You can save assertions to have them continuously executed in the system.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Assertions.

**Result:** The **Assertions** page opens.

- 2. In the query field, enter a query.
- 3. Select Enter.
- 4. To save the assertion, select **Save**.

Result: A dialog shows.

5. In the Name field, enter a name for the query.

Save assertion	×
Name	
Description	
	10
Note	
	h
Group	New group
Choose a group 🕶	
O Is security ? Is operational ? Assertion Check Interval 10	
Can send alerts	
Choose the asserted table's specific fields to include in the Description	
Choose fields to include 🕶	
Query	
links   where protocol == telnet   assert_empty	
Save	Cancel

6. In the **Description** field, enter a description.

- 7. To assign the assertion to a group, in the **Group** field, select one of the following
  - a. From the dropdown menu, select an existing group.
  - b. Select Save.
  - c. To create a new group, select **New group**. **Result:** A dialog shows.
  - d. In the **Group name** field, enter a group name for the assertion.
  - e. Select Save.
- 8. Choose from one of these options:

#### Choose from:

- Is security ?
- Is operational ?
- 9. In the **Assertion Check Interval** field, choose the interval in seconds at which the assertion will be rechecked.



You can select an interval between 10 seconds and 1 day.

- 10. **Optional:** If you want the assertion to trigger an alert, select the **Can send alerts** checkbox.
- 11. From the **Choose the asserted table's specific fields to include in the Description** dropdown, select the fields to include in the assertion description.
- 12. In the **Query** field, enter the assertion query.
- 13. Select Save.

**Result:** The saved assertion will be listed at the bottom of the page with a green or red color to indicate the result.

## **Edit an assertion**

This lets you edit the details for an existing assertion.

#### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Assertions.

Result: The Assertions page opens.

- 2. In the query field, enter a query.
- 3. To execute the query, elect **Enter**.

### Note:

You can use the logical operators && (and) and || (or) to combine multiple assertions. Round brackets () change the logical grouping as in a mathematical expression.

4. Optional: To the right of the query field, select the debug  $\bigstar$  icon.

### Note:

Because assertions with logical operators and brackets can quickly become complex, the debug icon decomposes the query, and executes each part to show intermediate results.

Assertions						≇ Configure			
ງ (links   wher	e protocol == telnet   asse	rt_empty && links   where	protocol == iec104   assert_em	npty) && (nodes   w	here is_learned == false	e   assert_empt	y)		Ŵ
Result ((links   v	where protocol == teln	et   assert_empty && li	nks   where protocol == ie	c104   assert_en	npty) && (nodes   w	here is_learne	ed == false   as	sert_empty	))
ñ Debug									
i Debug		Query		Resu	it	Query	without assertion	n	
nks   where protocol =	== telnet   assert_empty			true	links   where proto	col == telnet			
nks   where protocol =	== iec104   assert_empty			false	links   where proto	col == iec104			
nodes   where is_learned == false   assert_empty			false	nodes   where is_learned == false					
Live asserti	ons				Current group: links	New group	Edit group Delete	group	t Import
Page 1 of 1, 1 entri	ies							👁 12 sel	ected 🕶
ACTIONS	NAME FAILED SING	# FAILURES PACKET	FILTER CAN SEND ALERTS	IS SECURITY	CAN REQUEST TRACE	ALERT DELAY	ALERT RISK		
2 8 A D	Ildo links never	0	false	false	falso	10	0	17:22:52 701	linke Lud

#### Result: The debug section shows.

## **Configure an assertion**

This lets you configure the execution interval of the assertions, in seconds.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Assertions.

**Result:** The **Assertions** page opens.

2. In the top right, select **Configure**.

**Result:** A dialog opens.

3. In the **Execution interval (seconds)** field, enter an interval.

Configure assertions	×
Execution interval (seconds)	
10	
Change the execution interval of the assertions	
	Save Cancel

4. Select Save.

## Configure an assertion on links

This lets you configure the scope of the assertion for the related links.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Network.

Result: The Network page opens.

- Select Links.
   Result: The Links page opens.
- 3. To the left of the applicable link, select the configure = icon. **Result:** A dialog opens.
- 4. Optional:

Select Is persistent.

Configure <b>192.168.68.52-255.255.255.255/other</b> *
☐ <b>Is persistent</b> Raise an alert when a new TCP handshake is detected on this link
Alert on SYN
Raise an alert when a TCP SYN packet is detected on this link
Track availability (seconds)
Notify the link events when the link communication is interrupted or resumed
Last activity check (seconds)
Raise an alert when the link become inactive for more than the specified amount of seconds
Save Cancel

#### Note:

When selected, this check raises a new alert whenever a *transmission control protocol (TCP)* handshake is successfully completed on the link.

### 5. Optional: Select Alert on SYN.

### Note:

When selected, this check raises a new alert whenever a client sends a TCP SYN on the link.

6. Optional: Select Track availability (seconds).

### Note:

When selected, a link is considered non-functioning if it is unresponsive for the specified time.

7. Optional: Select Last activity check (seconds).

### Note:

When selected, this check raises an alert when the link is not receiving data for more than the specified time.

8. Select Save.

### Results

The assertion has been configured.

## Configure an assertion on variables

This lets you configure the scope of the assertion for the related variables.

### Procedure

1. In the top navigation bar, select  $\equiv$  icon > Process.

Result: The Process page opens.

- Select List.
   Result: The List page opens.
- 3. To the left of the applicable link, select the configure = icon. **Result:** A dialog opens.

#### 4. Optional:

In the Label field, enter a label for the assertion.

Configure 10.168.1.54/1/ir9	×
Label	
ir9 at RTU 1	
History size	
0	
Set the variable history size. When size is 0, history is disabled. When is higher than 0, it is enabled and the size value suggests the system how many values should be kept, according to resources availability.	
Last activity check	
Raise an alert when the variable is not updated for more than the specified amount of seconds	
Invalid quality check	
Raise an alert when the variable keeps the invalid quality for more than the specified amount of seconds	
Disallowed qualities check	_
Raise an alert when the variable has one of the specified qualities. Possible values are: invalid, not topical, blocked, substituted, overflow, reserved, questionable, out of range, bad reference, oscillatory, failure, inconsistent, inaccurate, test. Multiple values can be separated by comma.	

5. Optional: In the History size field, enter a value.

### Note:

This sets the *variable* history size. When the size is 0, history is disabled. When it is higher than 0, it is enabled, and the size value suggests how many values that the system should keep, depending on the available resources. 6. Optional: In the Last activity check field, enter a value.

## Note:

When selected, this check raises an alert when the *Variable* is either not measured or is changed for more than the specified number of seconds.

7. Optional: In the Invalid quality check field, enter a value.

### Note:

When selected, this check raises an alert when the *Variable* maintains an invalid quality for more than the specified amount of seconds.

8. Optional: In the Disallowed quality check field, enter a value.

### Note:

When selected, this check raises an alert when the *Variable* gains one of the specified qualities.

9. Select Save.

#### Results

The assertion has been configured.



# **Chapter 10. Vulnerabilities**


The Nozomi Networks software continuously discovers vulnerabilities in monitored assets.

The Nozomi Networks software continuously discover vulnerabilities. To do this, it matches the *Common Platform Enumeration (CPE)* of a device with the National Vulnerability Database, and other data sources.

The Vulnerabilities page has these tabs:

- Assets (on page 146)
- List (on page 147)
- Stats (on page 148)

# Assets

The **Assets** page shows a list of assets with known vulnerabilities, along with a summary of the severity of the vulnerability.

NOZOMI = 100 Sens	ors 🔿 Alerts 🖵 Assets 🖓	Queries 🔅 Smart Polling 📩 Ar	c	\$ \$
Vulnerabilities				Assets List Stats
Page 1 of 1, 10 entries				Only most likely 🌒 🛱 Live 🌒 🎵
ASSET	TYPE	OS/FIRMWARE	COUNT SCORE DIS	TRIBUTION SCORE GROUPS
				1000 100
172.18.252.169	computer	Windows 10	1263	1099 130
<b>§</b> 172.16.44.144	computer	Mindows 7	1089	389 698
<b>§</b> 172.16.44.150	computer	Nindows 7	1089	389 698
<b>§</b> 172.16.44.186	computer	Mindows 7	1089	389 698
<b>§</b> 172.16.44.216	computer	Mindows 7	1089	389 698
<b>§</b> 172.16.44.85	computer	灯 Windows 7	1089	389 698
<b>§</b> 172.16.45.62	computer	灯 Windows 7	1089	389 698
<b>§</b> 172.16.46.16	computer	🝠 Windows 7	1089	389 698
\$ 172.17.50.95	computer	Windows 10	1484	1262 215
S 172.18.66.27	computer	Ar Windows 7	1089	389 698

### Figure 45. Assets page

### Only most likely

This toggle lets you filter the view to show only the assets the match the criteria that you have set for likelihood threshold.

# Likelihood threshold settings

**Likelihood threshold** is a value between 0.1 and 1.0 where 1.0 represents the maximum likelihood of the *Common Vulnerabilities and Exposures (CVE)* to be present. Likelihood is the confidence of the software's correct assignment of a *CPE* to the hardware of the monitored asset. The higher the likelihood, the higher the software's confidence that the vulnerabilities assigned to an asset are in fact are relevant to that asset. **Likelihood threshold** is the minimum likelihood a vulnerability needs in order for it to be shown in this page when the **Only most likely** toggle is set to on. As a guideline, we suggest that you use:

- 0.8 for a high level of confidence
- 0.5 for a medium level of confidence
- 0.3 for a low level of confidence

# Live / refresh

The Live icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

# List

The **List** page shows a comprehensive list of vulnerabilities in the environment. This lets you perform global, in-depth analysis.

	OMI ≡	🕪 Sensors	Alerts	, Q A	ssets 🛛 Queries 🚸 Smart Polling 🔆 Arc		ស៊្	9
Vulnera	bilities					Assets	List St	ats
Page 1 of 1026, 25646 entries / filtered by resolved: false 🕱 Export 🖒 Only unresolved 💽 Live 💽 ∫ 🔹 12 selected 🔻								ted -
ACTIONS	CVE	NODE	SCORE	CWE	CWE NAME	CVE CREATION DATE	DISCOVERY DATE	
						Н∢►И	н ч н	
- B	CVE-2003-0904	172.16.37.24	6	200	Exposure of Sensitive Information to an Unauthorized Actor	2004-01-20 06:00:00.000	2023-09-11 12:20:20.513	cpe:/o:n
□ ₿	CVE-2004-0119	172.16.37.24	7.5	476	NULL Pointer Dereference	2004-06-01 06:00:00.000	2023-09-11 12:20:20:799	cpe:/o:n
B B B C	CVE-2004-0840	172.16.37.24	10	20	Improper Input Validation	2004-11-03 06:00:00.000	2023-09-11 12:20:20.805	cpe:/o:n
- B	CVE-2005-1987	172.16.37.24	7.5	120	Buffer Copy without Checking Size of Input ('Classic Buffer Overflow')	2005-10-13 12:02:00.000	2023-09-11 12:20:20.802	cpe:/o:n
□ ₿	CVE-2005-3921	6c:41:6a:60:99:23	2.6	79	Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting	1) 2005-11-30 12:03:00.000	2023-09-11 12:17:58.491	cpe:/o:c
- B	CVE-2006-4950	6c:41:6a:60:99:23	10	20	Improper Input Validation	2006-09-23 12:07:00.000	2023-09-11 12:17:58.491	cpe:/o:c
□ ₿	CVE-2007-0066	172.16.37.24	7.1	20	Improper Input Validation	2008-01-08 21:46:00.000	2023-09-11 12:20:20.510	cpe:/o:n
□ ₿	CVE-2007-0199	6c:41:6a:60:99:23	5	20	Improper Input Validation	2007-01-11 12:28:00.000	2023-09-11 12:17:58.496	cpe:/o:c
- B	CVE-2007-2587	6c:41:6a:60:99:23	6.3	20	Improper Input Validation	2007-05-10 02:19:00.000	2023-09-11 12:17:58.497	cpe:/o:c
□ ₿	CVE-2007-3034	172.16.37.24	9.3	189	Numeric Errors	2007-08-14 23:17:00.000	2023-09-11 12:20:20.512	cpe:/o:n
- B	CVE-2007-3898	172.16.37.24	6.4	16	Configuration	2007-11-14 02:46:00.000	2023-09-11 12:20:20:796	cpe:/o:n
- B	CVE-2007-5133	172.16.37.24	7.1	189	Numeric Errors	2007-09-27 21:17:00.000	2023-09-11 12:20:20.511	cpe:/o:n
□ ₿	CVE-2008-1436	172.16.37.24	9	264	Permissions, Privileges, and Access Controls	2008-04-21 19:05:00.000	2023-09-11 12:20:20.486	cpe:/o:n
- B	CVE-2008-1441	172.16.37.24	5.4	20	Improper Input Validation	2008-06-12 04:32:00.000	2023-09-11 12:20:20.803	cpe:/o:n
□₿	CVE-2008-1454	172.16.37.24	9.4	20	Improper Input Validation	2008-07-09 01:41:00.000	2023-09-11 12:20:20.551	cpe:/o:n
- B	CVE-2008-2249	172.16.37.24	9.3	189	Numeric Errors	2008-12-10 15:00:00.000	2023-09-11 12:20:20.552	cpe:/o:n
- B	CVE-2008-2250	172.16.37.24	7.2	264	Permissions, Privileges, and Access Controls	2008-10-15 02:12:00.000	2023-09-11 12:20:20.552	cpe:/o:n
□ ₿	CVE-2008-2251	172.16.37.24	7.2	399	Resource Management Errors	2008-10-15 02:12:00.000	2023-09-11 12:20:20.553	cpe:/o:n

### Figure 46. List page

### Export

The **Export** (1) icon lets you export the current list in either CSV or Microsoft Excel format.

### Only resolved

This lets you show only Unresolved vulnerabilities. Vulnerability status options are:

- Unresolved
- Mitigated
- Accepted

Mitigated and Accepted lead to a resolution status that equals true.

# Live / refresh

The **Live** icon lets you change live view on, or off. When live mode is on, the page will refresh approximately every five seconds.

### **Column selection**

The columns selection  $^{igodoldsymbol{\Theta}}$  icon lets you choose which columns to show or hide.

# Stats

The **Stats** page shows high level information in a graphical format that shows the top common platform enumerations (CPEs), common vulnerabilities and exposures (CVEs), and common weakness enumerations (CWEs).

NOZOMI ET WORKS E M Sensors 🚫 Alerts 🖵 Assets 🖉 Queries 🗞	Smart Polling	\$\$ @
Vulnerabilities		Assets List <b>Stats</b>
Top CPEs cpe/amicrosoftwindo: 16 % cpe/amicrosoftwindo: 23 % cpe/amicrosoftwindo: 24 % cpe/amicrosoftwindo: 28 % cpe/amicrosoftwindo: 38 % cpe/amicrosoftwindo: 38 %	Top CWEs Improper Restriction of: 1.1.8 Concurrent Execution us: 1.2.8 Origin Validation Error. 1.2.8 Incorrect Default Permis: 1.5.8 Improper Neutralization	Use After Free: 26.5 % Out-of-bounds Write: 22.0 %
Top CVEs CVE-2020-6453: 1.0 % CVE-2020-6533: 1.0 % CVE-2020-6533: 1.0 % CVE-2020-6543: 1.0 % CVE-2020-6412: 1.2 % CVE-2020-6412: 1.0 %	Improper input Validat: 18.3 3	

Figure 47. Stats page

# Top CPEs

This section shows the:

- Title of vulnerability
- Percentage of the total vulnerabilities
- Actual count of that vulnerability

# **Top CWEs**

This section shows the:

- Title of vulnerability
- Percentage of the total vulnerabilities
- Actual count of that vulnerability

# **Top CVEs**

This section shows the:

- Title of vulnerability
- Date of vulnerability type
- Percentage of the total vulnerabilities
- Actual count of that vulnerability

# Details page

The details page shows you all the details for the related vulnerability.



Figure 48. Details page



# **Chapter 11. Administration**



# Administration page

The administration page lets a user with administrator privileges configure settings and do other tasks.

For more details, see the CMC - Administrator Guide.



# **Chapter 12. Personal settings**



The personal settings page lets you do actions that are specific to your profile.

## General

You can select the O icon to access the personal settings menu.



### Figure 49. Personal settings menu

The personal settings page lets you Clear your personal settings (on page 158)

#### Logout

A button in the personal settings menu lets you log out of the software.

# **Clear your personal settings**

The profile settings menu lets you clear your personal settings that are stored in the local browser local.

## Procedure

1. In the top navigation bar, select O

**Result:** A menu shows.

- 2. Select Other actions.
- 3. Select Clear personal settings.

Result: A dialog shows.

4. Select OK.

Are you sure?		
	Cancel	OK

### Results

Your personal settings have been cleared from the local browser.

# **Chapter 13. Troubleshooting**



# Troubleshooting

A list of the most useful troubleshooting tips for the Central Management Console (CMC).

If the sensor is not appearing at all in the CMC:

- Make sure that firewall(s) between the sensor and the CMC permit traffic on TCP/443 port (hypertext transfer protocol secure (HTTPS)), with the sensor as **Source** and the CMC as the **Target**
- Make sure that the tokens are correctly configured both in the sensor and the  $\underbrace{\textit{CMC}}$
- Make sure that in the /data/log/n2os/n2osjobs.log file for connection errors

The **Sensor ID** is stored in the /data/cfg/.appliance-uuid file. Do not edit this file after the sensor is connected to the Vantage, or the *CMC*, since it is the unique identifier of the sensor inside Vantage and the *CMC*. In case a forceful change of the **Appliance ID** is needed, you will need to remove the old data from Vantage or the *CMC* by removing the old **Appliance ID** entry.

If an issue occurs during the setup of a sensor, you should:

- Delete the sensor, or
- Clear the sensor's data from Vantage or the CMC



# Glossary



#### Amazon Machine Image

An AMI is a type of virtual appliance that is used to create a virtual machine for the Amazon Elastic Compute Cloud (EC2), and is the basic unit of deployment for services that use EC2 for delivery.

#### Amazon Web Services

AWS is a subsidiary of the Amazon company that provides on-demand cloud computing platforms governments, businesses, and individuals on a pay-asyou-go basis.

#### Application Programming Interface

An API is a software interface that lets two or more computer programs communicate with each other.

#### Assertion Consumer Service

An ACS is a version of the SAML standard that is used to exchange authentication and authorization identities between security domains.

#### Asset Intelligence™

Asset Intelligence is a continuously expanding database of modeling asset behavior used by N2OS to enrich asset information, and improve overall visibility, asset management, and security, independent of monitored network data.

#### **Berkeley Packet Filter**

The BPF is a technology that is used in some computer operating systems for programs that need to analyze network traffic. A BPF provides a raw interface to data link layers, permitting raw link-layer packets to be sent and received.

#### Central Management Console

The Central Management Console (CMC) is a Nozomi Networks product that has been designed to support complex deployments that cannot be addressed with a single sensor. A central design principle behind the CMC is the unified experience, that lets you access information in a similar way as on the sensor.

#### **Central Processing Unit**

The main, or central, processor that executes instructions in a computer program.

#### **Certificate Authority**

A certificate, or certification authority (CA) is an organization that stores, signs, and issues digital certificates. In cryptography, a digital certificate certifies the ownership of a public key by the named subject of the certificate.

#### Classless Inter-Domain Routing

CIDR is a method for IP routing and for allocating IP addresses.

#### Command-line interface

A command-line processor uses a command-line interface (CLI) as text input commands. It lets you invoke executables and provide information for the actions that you want them to do. It also lets you set parameters for the environment.

#### Comma-separated Value

A CSV file is a text file that uses a comma to separate values.

#### Common Event Format

CEF is a text-based log file format that is used for event logging and information sharing between different security devices and software applications.

#### Common Platform Enumeration

CPE is a structured naming scheme for information technology (IT) systems, software, and packages. CPE is based on the generic syntax for Uniform Resource Identifiers (URI) and includes a formal name format, a method for checking names against a system, and a description format for binding text and tests to a name.

#### Common Vulnerabilities and Exposures

CVEs give a reference method information-security vulnerabilities and exposures that are known to the public. The United States' National Cybersecurity FFRDC maintains the system.

#### Common Weakness Enumeration

CWE is a category system for software and hardware weaknesses and vulnerabilities. It is a community project with the aim to understand flaws in software and hardware and create automated tools that can be used to identify, fix, and prevent those flaws.

#### **Configuration file**

A CFG file is a configuration, or config, file. They are files that are used to configure the parameters and initial settings for a computer program.

#### Domain Name Server

The DNS is a distributed naming system for computers, services, and other resources on the Internet, or other types of Internet Protocol (IP) networks.

#### ESXi

VMware ESXi (formerly ESX) is an enterprise-class, type-1 hypervisor developed by VMware for deploying and serving virtual computers. As a type-1 hypervisor, ESXi is not a software application that is installed on an operating system (OS). Instead, it includes and integrates vital OS components, such as a kernel.

#### Extensible Markup Language

XML is a markup language and file format for the storage and transmission of data. It defines a set of rules for encoding documents in a format that is both humanreadable and machinereadable.

#### Federal Information Processing Standards

FIPS are publicly announced standards developed by the National Institute of Standards and Technology for use in computer systems by non-military American government agencies and government contractors.

#### File Allocation Table

FAT is a file system architecture used in computers for managing disk space. It maintains a table to track the allocation of files on a disk, supporting efficient data storage, access, and management

#### File Transfer Protocol

FTP is a standard communication protocol that is used for the transfer of computer files from a server to a client on a computer network. FTP is built on a client–server model architecture that uses separate control and data connections between the client and the server.

# Fully qualified domain name

An FQDN is a complete and specific domain name that specifies the exact location in the hierarchy of the Domain Name System (DNS). It includes all higher-level domains, typically consisting of a host name and domain name, and ends in a top-level domain.

#### **Gigabit per second**

Gigabit per second (Gb/s) is a unit of data transfer rate equal to: 1,000 Megabits per second.

#### Gigabyte

The gigabyte is a multiple of the unit byte for digital information. One gigabyte is one billion bytes.

#### Graphical User Interface

A GUI is an interface that lets humans interact with electronic devices through graphical icons.

#### Graphics Interchange Format

GIF is a bitmap image format that is widely used on the internet.

#### High Availability

High Availability is a mode that permits the CMC to replicate its own data on another CMC.

#### Host-based intrusiondetection system

HIDS is an internal Nozomi Networks solution that uses sensors to detect changes to the basic firmware image, and record the change.

#### Hypertext Markup Language

Hypertext Markup Language (HTML) is the standard markup language used to structure and display content on the web. It defines the structure of web pages using elements represented by tags.

#### Hypertext Transfer Protocol

HTTP is an application layer protocol in the Internet protocol suite model for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web, where hypertext documents include hyperlinks to other resources that the user can easily access, for example by a mouse click or by tapping the screen in a web browser.

#### Hypertext Transfer Protocol Secure

HTTPS is an extension of the Hypertext Transfer Protocol (HTTP). It is used for secure communication over a computer network, and is widely used on the Internet. In HTTPS, the communication protocol is encrypted using Transport Layer Security (TLS) or, formerly, Secure Sockets Layer (SSL). The protocol is therefore also referred to as HTTP over TLS, or HTTP over SSL.

#### Identifier

A label that identifies the related item.

#### **Identity Provider**

An IdP is a system entity that creates, maintains, and manages identity information. It also provides authentication services to applications within a federation, or a distributed network.

#### Internet Control Message Protocol

ICMP is a supporting protocol in the internet protocol suite. Network devices use it to send error messages and operational information to indicate success or failure when communicating with another IP address. ICMP differs from transport protocols such as TCP and UDP in that it is not typically used to exchange data between systems.

#### Internet of Things

The IoT describes devices that connect and exchange information through the internet or other communication devices.

#### Internet Protocol

An Internet Protocol address, or IP address, identifies a node in a computer network that uses the Internet Protocol to communicate. The IP label is numerical.

#### Intrusion Detection System

An intrusion detection system (IDS), which can also be known as an intrusion prevention system (IPS) is a software application, or a device, that monitors a computer network, or system, for malicious activity or policy violations. Such intrusion activities, or violations, are typically reported either to a system administrator, or collected centrally by a security information and event management (SIEM) system.

#### JavaScript Object Notation

JSON is an open standard file format for data interchange. It uses human-readable text to store and transmit data objects, which consist of attribute-value pairs and arrays.

#### Joint Photographic Experts Group

JPEG, or JPG, is a method of lossy compression that is used for digital images. The degree of compression can be adjusted, allowing a selectable tradeoff between storage size and image quality.

#### Lightweight Directory Access Protocol

LDAP is an open, vendorneutral, industry standard application protocol that lets you access and maintain distributed directory information services over an internet protocol (IP) network.

#### Lightweight Directory Access Protocol Secure

LDAP over SSL or Secure LDAP is the secure version of LDAP.

#### Managed Security Service Provider

In computing, MSSP are network security services that have been outsourced to a service provider. A company that provides this type of service is known as an MSSP.

#### Management Information Base

A MIB is a collection of information organized hierarchically. It is used by network management systems to monitor and control network devices through protocols like SNMP.

#### Media Access Control

A MAC address is a unique identifier for a network interface controller (NIC). It is used as a network address in network segment communications. A common use is in most IEEE 802 networking technologies, such as Bluetooth, Ethernet, and Wi-Fi. MAC addresses are most commonly assigned by device manufacturers and are also referred to as a hardware address, or physical address. A MAC address normally includes a manufacturer's organizationally unique identifier (OUI). It can be stored in hardware, such as the card's read-only memory, or by a firmware mechanism.

#### Megabyte

The megabyte is a multiple of the unit byte for digital information. One megabyte is one million bytes.

#### Message Queuing Telemetry Transport

Message Queuing Telemetry Transport is a lightweight, publish-subscribe network protocol designed for constrained devices and lowbandwidth, high-latency, or unreliable networks. It is commonly used in Internet of Things (IoT) applications.

#### Network Address Translation

NAT is a method of mapping an internet protocol (IP) address space into another one. This is done by modifying network address information in the IP header of packets while in transit across a traffic routing device.

#### Network-Attached Storage

NAS is a dedicated file storage system that provides local-area network (LAN) users with centralized, shared access to data through standard protocols such as NFS or SMB.

#### Network Interface Controller

A network interface controller (NIC), sometimes known as a network interface card, is a computer hardware component that lets a computer connect to a computer network.

#### Network Time Protocol

The NTP is a networking protocol to synchronize clocks between computer systems over variable-latency, packetswitched data networks.

#### Nozomi Networks Operating System

N2OS is the operating system that the core suite of Nozomi Networks products runs on.

#### Nozomi Networks Query Language (N2QL)

N2QL is the language used in queries in Nozomi Networks software.

#### **Open Virtual Appliance**

An OVA file is an open virtualization format (OVF) directory that is saved as an archive using the .tar archiving format. It contains files for distribution of software that runs on a virtual machine. An OVA package contains a .ovf descriptor file, certificate files, an optional .mf file along with other related files.

#### **Operating System**

An operating system is computer system software that is used to manage computer hardware, software resources, and provide common services for computer programs.

#### **Operational Technology**

OT is the software and hardware that controls and/ or monitors industrial assets, devices and processes.

#### Packet Capture

A pcap is an application programming interface (API) that captures live network packet data from the OSI model (layers 2-7).

#### Packet Capture Next Generation

A pcapNg is the latest version of a pcap file, an application programming interface (API) that captures live network packet data from the OSI model (layers 2-7).

#### Portable Document Format

PDF is a Adobe file format that is used to present documents. It is independent of operating systems (OS), application software, hardware.

#### Portable Network Graphics

PNG is a raster graphics file format that supports lossless data compression.PNG was developed as an improved, non-patented replacement for graphics interchange format (GIF).

#### Privacy-Enhanced Mail

PEM is a standard file format that is used to store and send cryptographic keys, certificates, and other data. It is based on a set of 1993 IETF standards.

#### Programmable Logic Controller

A PLC is a ruggedized, industrial computer used in industrial and manufacturing processes.

#### Protected Extensible Authentication Protocol

PEAP is a protocol that encloses the Extensible Authentication Protocol (EAP) within an encrypted and authenticated Transport Layer Security (TLS) tunnel.

#### Random-access Memory

Computer memory that can be read and changed in any order. It is typically used to store machine code or working data.

#### Representational State Transfer

Representational State Transfer (REST) is an architectural style for designing networked applications. It uses stateless, client-server communication via standard HTTP methods (GET, POST, PUT, DELETE) to access and manipulate web resources represented in formats like JSON or XML.

#### Seamless Message Protocol

Seamless Message Protocol is a communication protocol used primarily in industrial automation for device-level communication. It enables data exchange between controllers and devices over Ethernet networks.

#### Secure Copy Protocol

SCP is a protocol for the secure transfer of computer files between a local host and a remote host, or between two remote hosts. It is based on the secure shell (SSH) protocol.

#### Secure Shell

A cryptographic network protocol that let you operate network services securely over an unsecured network. It is commonly used for command-line execution and remote login applications.

#### Secure Sockets Layer

A secure sockets layer ensures secure communication between a client computer and a server. SAML is an open standard, XML-based markup language for security assertions. It allows for the exchange of authentication and authorization data different parties such as a service provider and an identity provider.

#### Security Information and Event Management

SIEM is a field within the computer security industry, where software products and services combine security event management (SEM) and security information management (SIM). SIEMs provide real-time analysis of security alerts.

#### Server Message Block

Is a communication protocol which provides shared access to files and printers across nodes on a network of systems. It also provides an authenticated interprocess communication (IPC) mechanism.

#### Simple File Transfer Protocol

SFTP was proposed as an unsecured file transfer protocol with a level of complexity intermediate between TFTP and FTP. It was never widely accepted on the internet.

#### Simple Mail Transfer Protocol

SMTP is an internet standard communication protocol that is used for the transmission of email. Mail servers and other message transfer agents use SMTP to send and receive mail messages.

#### Simple Network Management Protocol

SNMP is an Internet Standard protocol for the collection and organization of information about managed devices on IP networks. It also lets you modify that information to change device behavior. Typical devices that support SNMP are: printers, workstations, cable modems, switches, routers, and servers.

#### Simple Text Oriented Messaging Protocol

STOMP is a simple textbased protocol, for working with message-oriented middleware (MOM). It provides an interoperable wire format that allows STOMP clients to talk with any message broker supporting the protocol.

#### Spanning Tree Protocol

Spanning Tree Protocol is a network protocol that prevents loops in Ethernet networks by creating a spanning tree topology. It selectively blocks redundant paths and ensures a loop-free logical topology.

#### Structured Threat Information Expression

STIX<sup>™</sup> is a language and serialization format for the exchange of cyber threat intelligence (CTI). STIX is free and open source.

# Supervisory control and data acquisition

SCADA is a control system architecture which has computers, networked data communications and graphical user interfaces for high-level supervision of processes and machines. It also covers sensors and other devices, such as programmable logic controllers (PLC), which interface with process plant or machinery.

#### Text-based User Interface

In computing, a textbased (or terminal) user interfaces (TUI) is a retronym that describes a type of user interface (UI). These were common as an early method of human-computer interaction, before the more modern graphical user interfaces (GUIs) were introduced. Similar to GUIs, they might use the entire screen area and accept mouse and other inputs.

### Threat Intelligence™

Nozomi Networks **Threat** Intelligence<sup>™</sup> feature monitors ongoing OT and IoT threat and vulnerability intelligence to improve malware anomaly detection. This includes managing packet rules, YARA rules, STIX indicators, Sigma rules, and vulnerabilities. **Threat** Intelligence<sup>™</sup> allows new content to be added, edited, and deleted, and existing content to be enabled or disabled.

#### Transmission Control Protocol

One of the main protocols of the Internet protocol suite.

#### Transport Layer Security

TLS is a cryptographic protocol that provides communications security over a computer network. The protocol is widely used in applications such as: HTTPS, voice over IP, instant messaging, and email.

#### Uniform Resource Identifier

A URI is a unique string of characters used to identify a logical or physical resource on the internet or local network.

#### Uniform Resource Locator

An URL is a reference to a resource on the web that gives its location on a computer network and a mechanism to retrieving it.

#### Uninterruptible Power Supply

A UPS is an electric power system that provides continuous power. When the main input power source fails, an automated backup system continues to supply power.

#### Universally unique identifier

A UUID is a 128-bit label that is used for information in computer systems. When a UUID is generated with standard methods, they are, for all practical purposes, unique. Their uniqueness is not dependent on an authority, or a centralized registry. While it is not impossible for the UUID to be duplicated, the possibility is generally considered to be so small, as to be negligible. The term globally unique identifier (GUID) is also used in some, mostly Microsoft, systems.

#### **Universal Serial Bus**

Universal Serial Bus (USB) is a standard that sets specifications for protocols, connectors, and cables for communication and connection between computers and peripheral devices.

#### **User Interface**

An interface that lets humans interact with machines.

#### Variable

In the context of control systems, a variable can refer to process values that change over time. These can be temperature, speed, pressure etc.

#### Virtual DOM

A virtual DOM, or vdom, is a lightweight JavaScript representation of the Document Object Model (DOM). It is used in declarative web frameworks such as Elm, React, and Vue.js. It enables the updating of the virtual DOM is comparatively faster than updating the actual DOM.

#### Virtual Hard Disk

VHD is a file format that represents a virtual hard disk drive (HDD). They can contain what is found on a physical HDD, such as disk partitions and a file system, which in turn can contain files and folders. They are normally used as the hard disk of a virtual machine (VM). They are the native file format for Microsoft's hypervisor (virtual machine system), Hyper-V.

#### Virtual Local Area Network

A VLAN is a broadcast domain that is isolated and partitioned in a computer network at the data link layer (OSI layer 2).

#### Virtual Machine

A VM is the emulation or virtualization of a computer system. VMs are based on computer architectures and provide the functionality of a physical computer.

#### ZIP

An archive file format that supports lossless data compression. The format can use a number of different compression algorithms, but DEFLATE is the most common one. A ZIP file can contain one or more compressed files or directories.