

NAE – IP SLA

Important! This guide assumes that the AOS-CX ova has been installed and works in GNS3 or EVE-NG. Please refer to GNS3/EVE-NG initial setup labs if required.

<https://www.eve-ng.net/index.php/documentation/howtos/howto-add-aruba-cx-switch/>

At this time, EVE-NG does not support exporting/importing AOS-CX startup-config. The lab user should copy/paste the AOS-CX node configuration from the lab guide as described in the lab guide if required.

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Lab Objective

This lab will enable the reader to gain hands-on experience with NAE (Network Analytics Engine) technology on AOS-CX. It will also provide an example of NAE use-case and associated interest for in production network.

Lab Overview

This lab guide explains how to demonstrate the benefits of NAE (Network Analytics Engine) by showing automatic actions taken when IP-SLA reports average RTT higher than a pre-defined threshold. The use-case is kept as simple as possible so it can be easily reproduced.

In this demonstration, when the direct link between CX1 and CX3 is down, traffic is re-routed through a backup path that has higher latency. IP-SLA detects the latency increase and automatically performs a “show ip route”, so that the network admin can see and troubleshoot what happened during this event, the said event that could have been transient and during off-hour support time.

This lab guide explains how to configure NAE IP SLA agent on AOS-CX switch.

Please refer to the [AOS-CX 10.6 Network Analytics Engine Guide](https://support.hpe.com/hpsc/public/docDisplay?docId=a00108354en_us)
(https://support.hpe.com/hpsc/public/docDisplay?docId=a00108354en_us)

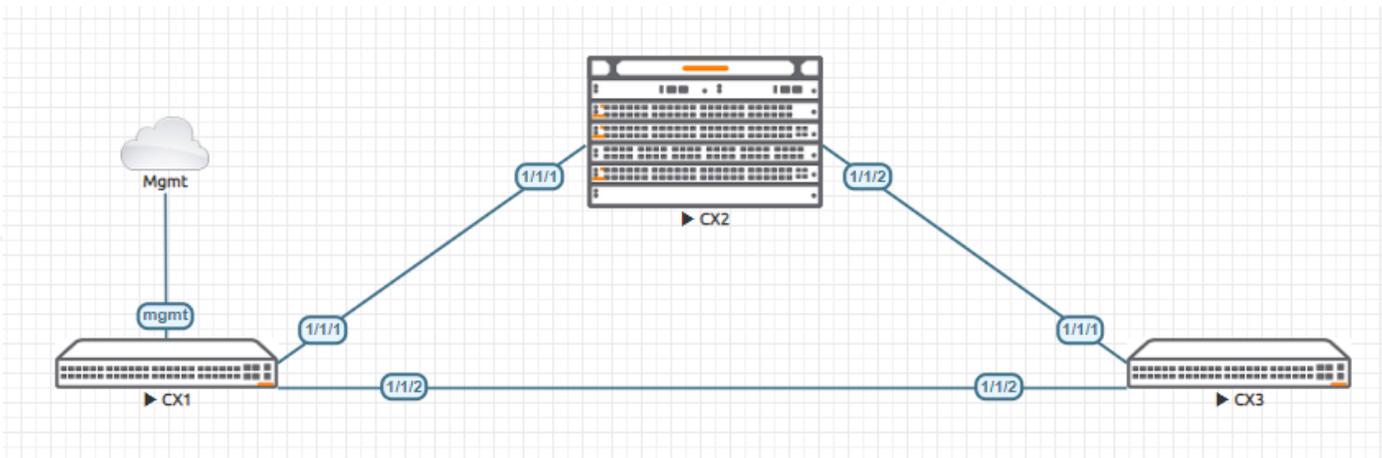
or [AOS-CX 10.6 NAE page](https://support.hpe.com/hpsc/public/docDisplay?docId=a00108354en_us) (https://support.hpe.com/hpsc/public/docDisplay?docId=a00108354en_us).

The minimum required AOS-CX Switch Simulator version for this lab is 10.5.

This lab uses EVE-NG but GNS3 might be used as well.

Lab Network Layout

Here is the proposed and simple topology.



Lab Tasks

Task 1 - Lab setup

- In EVE-NG, import the .zip lab file containing the “unl” file.
All the connections between nodes are already set-up. Appropriate numbers of CPUs (1), RAM (2048 MB) and interfaces are already allocated. (Or Interconnect switches as proposed).
- Check the connectivity as proposed above
- Start the 3 switches.
- Open each switch console and log in with user “admin”.
The switches will ask to enter a new password. This new password can be an empty password for simplicity in this lab.
- Change the switch hostnames to CX-1, CX-2, CX-3 as shown in the topology.
- Use external connection (refer to Lab Guide 2 if needed) in order to access the WEB-UI of the switch named CX1 that will run the NAE agent.
- Check that CX-1 received a DHCP IP address on the “mgmt” interface or set a static IP address as appropriated.

```

CX1
www.arubanetworks.com/arubaos-cx-ova
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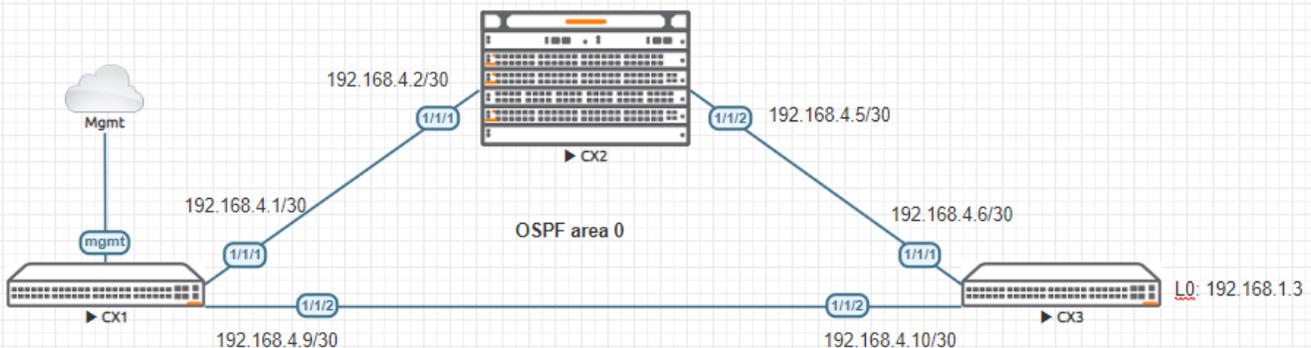
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12.211 and 12.212, Commercial Computer Software, Computer Software
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U.S. Government under vendor's standard commercial license.

CX-1 login: admin
Password:

Last login: 2020-08-10 21:30:08 from the console
User "admin" has logged in 7 times in the past 30 days
CX-1# show interface mgmt
  Address Mode           : dhcp
  Admin State           : up
  Mac Address           : 50:07:00:01:00:00
  IPv4 address/subnet-mask : 10.80.2.231/24
  Default gateway IPv4   : 10.80.2.3
  IPv6 address/prefix   :
  IPv6 link local address/prefix: fe80::5207:ff:fe01:0/64
  Default gateway IPv6   :
  Primary Nameserver    : 10.80.2.219
  Secondary Nameserver  :
CX-1#
  
```

Use show interface mgmt to identify IP address being assign if DHCP is used.

- Here is an example of IPs and interfaces that will be configured in this guide



- Set the IP address on each interfaces and enable interfaces (no shut).
- Configure OSPF on the 3 switches and include Loppback0 in OSPF area 0 on CX3. This loopback0 of CX3 will be the target for the IP-SLA configured on CX1.

Baseline Configuration proposal (for initial copy/paste):

CX1

```
hostname CX-1
led locator on
!
ssh server vrf mgmt
vlan 1
interface mgmt
  no shutdown
  ip dhcp
interface 1/1/1
  no shutdown
  ip address 192.168.4.1/30
  ip ospf 1 area 0.0.0.0
interface 1/1/2
  no shutdown
  ip address 192.168.4.9/30
  ip ospf 1 area 0.0.0.0
!
router ospf 1
  area 0.0.0.0
https-server vrf mgmt
```

CX2

```
hostname CX-2
led locator on
!
ssh server vrf mgmt
vlan 1
interface mgmt
  no shutdown
  ip dhcp
interface 1/1/1
  no shutdown
  ip address 192.168.4.2/30
  ip ospf 1 area 0.0.0.0
interface 1/1/2
  no shutdown
  ip address 192.168.4.5/30
  ip ospf 1 area 0.0.0.0
!
router ospf 1
  area 0.0.0.0
https-server vrf mgmt
```

CX3

```
hostname CX-3
led locator on
!
ssh server vrf mgmt
vlan 1
interface mgmt
  no shutdown
  ip dhcp
interface 1/1/1
  no shutdown
  ip address 192.168.4.6/30
  ip ospf 1 area 0.0.0.0
interface 1/1/2
  no shutdown
  ip address 192.168.4.10/30
  ip ospf 1 area 0.0.0.0
interface loopback 0
  ip address 192.168.1.3/32
  ip ospf 1 area 0.0.0.0
!
router ospf 1
  area 0.0.0.0
https-server vrf mgmt
```

- Verify the connectivity and routing as follows on each switch:

```

CX1
CX-1# show lldp neighbor-info

LLDP Neighbor Information
=====

Total Neighbor Entries      : 2
Total Neighbor Entries Deleted : 1
Total Neighbor Entries Dropped : 0
Total Neighbor Entries Aged-Out : 0

LOCAL-PORT  CHASSIS-ID          PORT-ID  PORT-DESC  TTL  SYS-NAME
-----
1/1/1       08:00:09:2b:b4:1f  1/1/1    1/1/1      120  CX-2
1/1/2       08:00:09:15:59:db  1/1/2    1/1/2      120  CX-3

CX-1# show ip ospf neighbors
OSPF Process ID 1 VRF default
=====

Total Number of Neighbors: 2

Neighbor ID    Priority  State          Nbr Address    Interface
-----
192.168.4.5    1        FULL/BDR       192.168.4.2    1/1/1
192.168.4.6    1        FULL/BDR       192.168.4.10   1/1/2

CX-1# show ip route

Displaying ipv4 routes selected for forwarding

'[x/y]' denotes [distance/metric]

192.168.1.3/32, vrf default
  via 192.168.4.10, [110/100], ospf
192.168.4.0/30, vrf default
  via 1/1/1, [0/0], connected
192.168.4.1/32, vrf default
  via 1/1/1, [0/0], local
192.168.4.4/30, vrf default
  via 192.168.4.2, [110/200], ospf
  via 192.168.4.10, [110/200], ospf
192.168.4.8/30, vrf default
  via 1/1/2, [0/0], connected
192.168.4.9/32, vrf default
  via 1/1/2, [0/0], local

CX-1# traceroute 192.168.1.3
traceroute to 192.168.1.3 (192.168.1.3), 1 hops min, 30 hops max, 3 sec. timeout, 3 probes
 1 192.168.1.3 87.993ms 9.617ms 6.145ms

```

Note: the nominal path from CX-1 to reach loopback of CX-3 is through the direct link between CX-1 and CX-3.

```

CX2
CX-2# show lldp neighbor-info

LLDP Neighbor Information
=====

```

```
Total Neighbor Entries      : 2
Total Neighbor Entries Deleted : 0
Total Neighbor Entries Dropped : 0
Total Neighbor Entries Aged-Out : 0
```

LOCAL-PORT	CHASSIS-ID	PORT-ID	PORT-DESC	TTL	SYS-NAME
1/1/1	08:00:09:b2:87:f5	1/1/1	1/1/1	120	CX-1
1/1/2	08:00:09:15:59:db	1/1/1	1/1/1	120	CX-3

```
CX-2# show ip ospf neighbors
OSPF Process ID 1 VRF default
=====
```

Total Number of Neighbors: 2

Neighbor ID	Priority	State	Nbr Address	Interface
192.168.4.1	1	FULL/DR	192.168.4.1	1/1/1
192.168.4.6	1	FULL/BDR	192.168.4.6	1/1/2

```
CX-2# show ip route
```

Displaying ipv4 routes selected for forwarding

'[x/y]' denotes [distance/metric]

```
192.168.1.3/32, vrf default
  via 192.168.4.6, [110/100], ospf
192.168.4.0/30, vrf default
  via 1/1/1, [0/0], connected
192.168.4.2/32, vrf default
  via 1/1/1, [0/0], local
192.168.4.4/30, vrf default
  via 1/1/2, [0/0], connected
192.168.4.5/32, vrf default
  via 1/1/2, [0/0], local
192.168.4.8/30, vrf default
  via 192.168.4.6, [110/200], ospf
  via 192.168.4.1, [110/200], ospf
```

CX3

```
CX-3# show lldp neighbor-info
```

```
LLDP Neighbor Information
=====
```

```
Total Neighbor Entries      : 2
Total Neighbor Entries Deleted : 0
Total Neighbor Entries Dropped : 0
Total Neighbor Entries Aged-Out : 0
```

LOCAL-PORT	CHASSIS-ID	PORT-ID	PORT-DESC	TTL	SYS-NAME
1/1/1	08:00:09:2b:b4:1f	1/1/2	1/1/2	120	CX-2
1/1/2	08:00:09:b2:87:f5	1/1/2	1/1/2	120	CX-1

```
CX-3# show ip ospf neighbors
OSPF Process ID 1 VRF default
=====
```

Total Number of Neighbors: 2

Neighbor ID	Priority	State	Nbr Address	Interface
192.168.4.5	1	FULL/DR	192.168.4.5	1/1/1

```

192.168.4.1      1          FULL/DR          192.168.4.9      1/1/2

CX-3# show ip route

Displaying ipv4 routes selected for forwarding

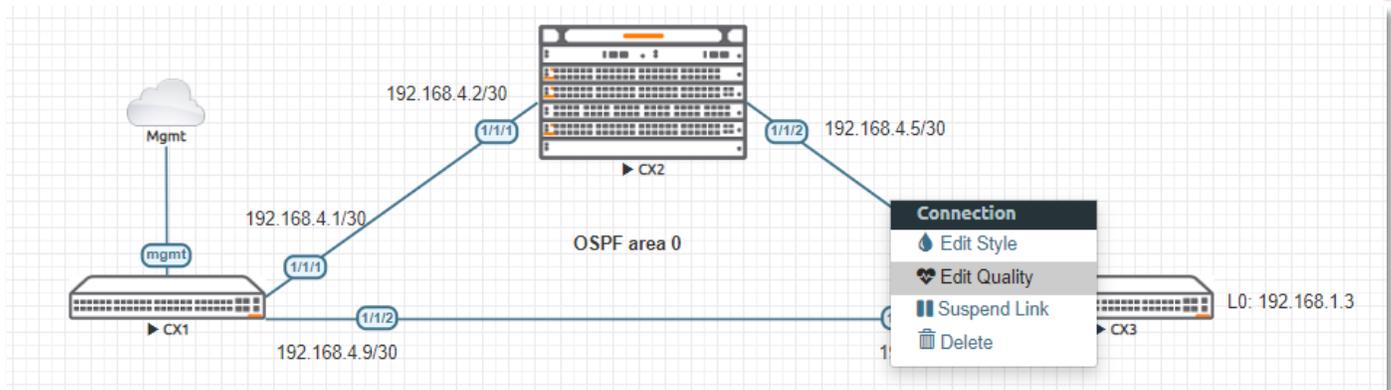
'[x/y]' denotes [distance/metric]

192.168.1.3/32, vrf default
  via loopback0, [0/0], local
192.168.4.0/30, vrf default
  via 192.168.4.9, [110/200], ospf
  via 192.168.4.5, [110/200], ospf
192.168.4.4/30, vrf default
  via 1/1/1, [0/0], connected
192.168.4.6/32, vrf default
  via 1/1/1, [0/0], local
192.168.4.8/30, vrf default
  via 1/1/2, [0/0], connected
192.168.4.10/32, vrf default
  via 1/1/2, [0/0], local
  
```

Task 2 - Add Latency

In EVE-NG or GNS3, there is possibility to adjust link latency. Set latency to 75ms between CX-2 and CX-3

In **EVE-NG**, select the link and right-click:



- Click on Edit Quality. In the pop-up, set symmetric delay to 75ms.

Link Quality: CX3 - CX2									
Interface	Delay (ms)	Jitter (ms)	Loss (%)	Rate(kbps)	Interface	Delay (ms)	Jitter (ms)	Loss (%)	Rate(kbps)
1/1/1	75	0	0	0	1/1/2	75	0	0	0

- Ping from CX-2 the CX-3 Loopback0, and check that RTT (Round Trip Time) is increased by 150ms (2x75).

```

CX2
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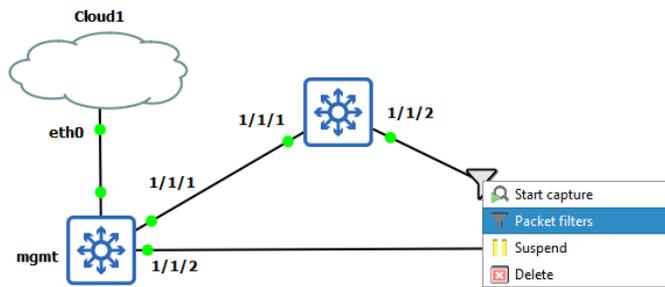
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CX-2 login: admin
Password:

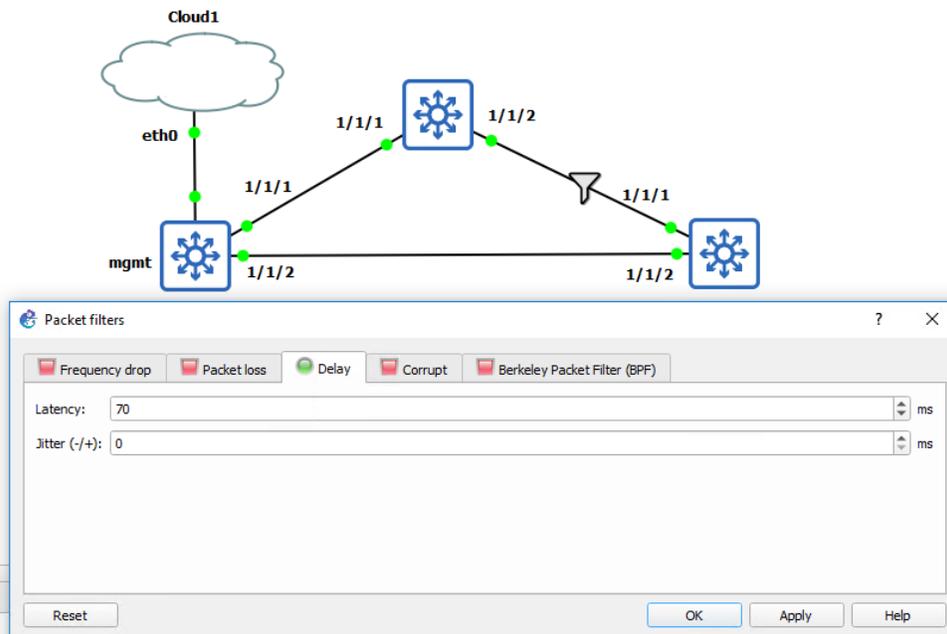
Last login: 2020-08-10 19:59:21 from the console
User "admin" has logged in 3 times in the past 30 days
CX-2#
CX-2# ping 192.168.1.3
PING 192.168.1.3 (192.168.1.3) 100(128) bytes of data:
108 bytes from 192.168.1.3: icmp_seq=1 ttl=64 time=151 ms
108 bytes from 192.168.1.3: icmp_seq=2 ttl=64 time=151 ms
108 bytes from 192.168.1.3: icmp_seq=3 ttl=64 time=151 ms
108 bytes from 192.168.1.3: icmp_seq=4 ttl=64 time=152 ms
108 bytes from 192.168.1.3: icmp_seq=5 ttl=64 time=152 ms

--- 192.168.1.3 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4004ms
rtt min/avg/max/mdev = 151.387/151.931/152.274/0.314 ms
CX-2#
  
```

- In **GNS3**: similarly right-click on the link and select packet filter:



- Select Delay tab and set the latency to 75 as below:



Task 3 - Configure IP-SLA

IP-SLA is configured on CX-1 with the very basic ICMP-echo probe mechanism, target IP being the loopback of CX-3 and period being 5s for demo purpose.

```
CX1(config)#
ip-sla sla1
  icmp-echo 192.168.1.3 probe-interval 5
  start-test
```

After a while, check IP-SLA results: ⁷⁵

```
CX1
CX-1# show ip-sla sla1 results

IP-SLA session status
IP-SLA Name           : sla1
IP-SLA Type           : icmp-echo
Destination Host Name/IP Address : 192.168.1.3
Source IP Address/IFName       :
Status                  : running

IP-SLA Session Cumulative Counters
Total Probes Transmitted      : 2241
Probes Timed-out              : 0
Bind Error                    : 0
Destination Address Unreachable : 0
DNS Resolution Failures      : 0
Reception Error               : 0
Transmission Error           : 0

IP-SLA Latest Probe Results
Last Probe Time               : 2020 Jul 09 13:44:52
Packets Sent                   : 1
Packets Received              : 1
Packet Loss in Test           : 0.0000%

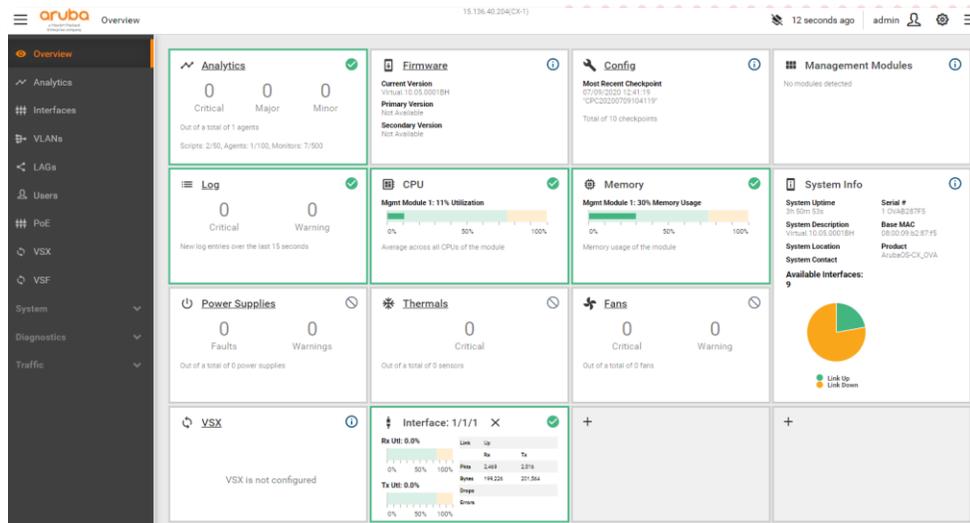
Minimum RTT (ms)              : 9
Maximum RTT (ms)              : 9
Average RTT (ms)              : 9
DNS RTT (ms)                  :
```

Average latency should be very variable as this is a simulator; from ~5ms to >40ms. This variability is expected depending on the hosting server performance and is not considered as a problem in the demo.

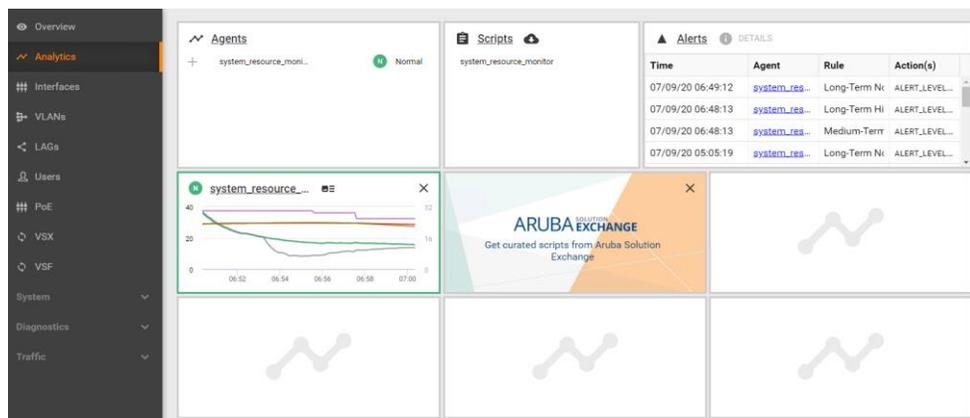
Task 4 - Install IP-SLA Threshold NAE script

Install default script from Aruba Solution Exchange

- Log into the CX-1 WEB-UI: https://<IP_ADDRESS_OF_MGMT_INTERFACE> with admin account (no password)
Reminder: The IP address of the mgmt interface was retrieved with “show interface mgmt” on CX-1 console.



- On the left pane, select Analytics:



- Click on Aruba Solution Exchange Snippet and wait a while for the list of script to load. Select “ipsla_threshold.1.0” and click INSTALL

Note: this is not the CX switch which does connect to internet but your browser connects to internet, which will download the script.

ARUBA SOLUTION EXCHANGE INSTALL DOWNLOAD VIEW SCRIPT

Installed	Name	Tags	Last Modified
<input type="checkbox"/>	interface_queues_monitor.1.0	8320, 8325, 8400x, nae-aruba-certified, interface	07/30/19 20:23:36
<input type="checkbox"/>	interface_state_stats_monitor.1.0	8400x, interface, 8320, nae-aruba-certified, link, tx, rx, port, 8325	07/30/19 03:21:01
<input type="checkbox"/>	interface_tx_rx_stats_monitor.2.2	8320, nae, 8325, nae-aruba-certified, arubaos-cx-min10.04	02/25/20 17:29:13
<input type="checkbox"/>	ipsla_threshold.1.0	arubaos, ipsla, nae-aruba-certified, 8320, voip, arubaos-switch, aru	11/21/19 15:50:14
<input type="checkbox"/>	lag_health_monitor.2.0	8400x, nae-aruba-certified, 8320, 8325, 6400, 6405, 6410, 6300, 6305	06/08/20 16:39:09
<input type="checkbox"/>	mac_addresses_decrease_rate_monitor.1.1	8400x, arubaos-cx-min-10.03, nae-aruba-certified, 8320, 8325, 6300	11/21/19 15:58:19
<input type="checkbox"/>	mac_count_monitor.2.1	8320, 8325, 6200, 8400x, nae-aruba-certified, arubaos-cx-min-10.02	06/08/20 16:39:57
<input type="checkbox"/>	neighbors_count_monitor.1.1	8400x, nae-aruba-certified, 8320, arubaos-cx-min-10.02, 8325, 6400	06/08/20 16:39:30
<input type="checkbox"/>	neighbors_decrease_rate_monitor.1.0	arubaos-cx-min-10.02, nae-aruba-certified, 8320, 8325, 6300, 6305	11/21/19 16:01:47
<input type="checkbox"/>	network_health_monitor.1.3	8400x, nae-aruba-certified, 8320, nae, 8325, arubaos-cx-min-10.04	06/11/20 18:34:06
<input type="checkbox"/>	ospfv2_interface_state_flaps_impact_monitor.1.1	8320, 8325, 8400x, nae-aruba-certified, ospfv2 area	07/30/19 03:16:35
<input type="checkbox"/>	ospfv2_interface_state_flaps_monitor.1.1	8320, 8325, 8400x, nae-aruba-certified, ospfv2 area, ospfv2 interf	07/30/19 03:16:51
<input type="checkbox"/>	power_supply_monitors.2.0-8320	8320, 8325, nae-aruba-certified	08/08/19 19:18:05
<input type="checkbox"/>	route_count_monitor.1.1	8400x, arubaos-cx-min-10.02, nae-aruba-certified, 8320, 8325, 6300	11/21/19 16:00:35
<input type="checkbox"/>	routes_decrease_rate_monitor.1.0	arubaos-cx-min-10.02, nae-aruba-certified, 8320, 8325, 6300, 6305	11/21/19 16:07:58
<input type="checkbox"/>	single_interface_link_state_monitor.1.0	8320, 8325, 8400x, nae-aruba-certified	07/29/19 21:30:17

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ARUBA SOLUTION EXCHANGE INSTALL DOWNLOAD VIEW SCRIPT

Installed	Name	Tags	Last Modified
<input type="checkbox"/>	interface_link_flap_monitor.1.3	8400x, nae-aruba-certified, 8320, nae, 8325, arubaos-cx-min-10.04	06/08/20 16:40:59
<input type="checkbox"/>	interface_link_state_monitor.1.0	8320, 8325, 8400x, nae-aruba-certified, interface, port	07/30/19 03:21:43
<input type="checkbox"/>	interface_queues_monitor.1.0	8320, 8325, 8400x, nae-aruba-certified, interface	07/30/19 20:23:36
<input type="checkbox"/>	interface_state_stats_monitor.1.0	8400x, interface, 8320, nae-aruba-certified, link, tx, rx, port, 8325	07/30/19 03:21:01
<input type="checkbox"/>	interface_tx_rx_stats_monitor.2.2	8320, nae, 8325, nae-aruba-certified, arubaos-cx-min10.04	02/25/20 17:29:13
<input checked="" type="checkbox"/>	ipsla_threshold.1.0	arubaos, ipsla, nae-aruba-certified, 8320, voip, arubaos-switch, aru	11/21/19 15:50:14
<input type="checkbox"/>	lag_health_monitor.2.0	8400x, nae-aruba-certified, 8320, 8325, 6400, 6405, 6410, 6300, 6305	06/08/20 16:39:09
<input type="checkbox"/>	mac_addresses_decrease_rate_monitor.1.1	8400x, arubaos-cx-min-10.03, nae-aruba-certified, 8320, 8325, 6300	11/21/19 15:58:19
<input type="checkbox"/>	mac_count_monitor.2.1	8320, 8325, 6200, 8400x, nae-aruba-certified, arubaos-cx-min-10.02	06/08/20 16:39:57
<input type="checkbox"/>	neighbors_count_monitor.1.1	8400x, nae-aruba-certified, 8320, arubaos-cx-min-10.02, 8325, 6400	06/08/20 16:39:30
<input type="checkbox"/>	neighbors_decrease_rate_monitor.1.0	arubaos-cx-min-10.02, nae-aruba-certified, 8320, 8325, 6300, 6305	11/21/19 16:01:47
<input type="checkbox"/>	network_health_monitor.1.3	8400x, nae-aruba-certified, 8320, nae, 8325, arubaos-cx-min-10.04	06/11/20 18:34:06
<input type="checkbox"/>	ospfv2_interface_state_flaps_impact_monitor.1.1	8320, 8325, 8400x, nae-aruba-certified, ospfv2 area	07/30/19 03:16:35
<input type="checkbox"/>	ospfv2_interface_state_flaps_monitor.1.1	8320, 8325, 8400x, nae-aruba-certified, ospfv2 area, ospfv2 interf	07/30/19 03:16:51
<input type="checkbox"/>	power_supply_monitors.2.0-8320	8320, 8325, nae-aruba-certified	08/08/19 19:18:05
<input type="checkbox"/>	route_count_monitor.1.1	8400x, arubaos-cx-min-10.02, nae-aruba-certified, 8320, 8325, 6300	11/21/19 16:00:35

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Confirm Installation

Install script ipsla_threshold?

Save running config to startup

CONFIRM CANCEL

- Confirm installation:
- Close the “successfully installed” message.

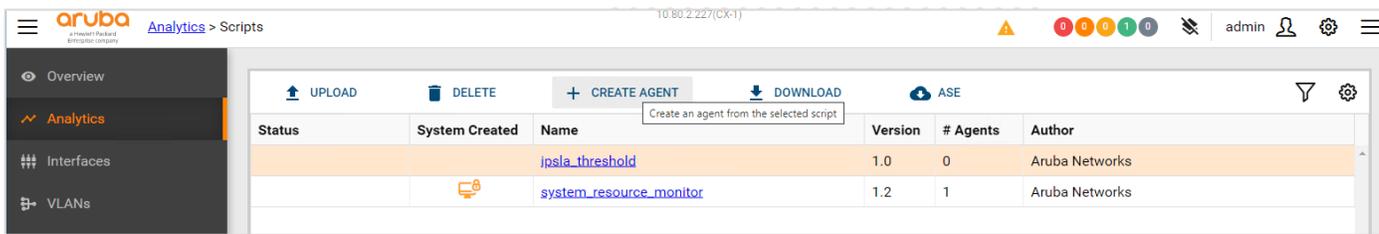
<input type="checkbox"/>	interface_tx_rx_stats_monitor.2.2	8320, nae, 8325, nae-aruba-certified, arubaos-cx-min10.04	
<input checked="" type="checkbox"/>	ipsla_thre	arubaos, ipsla, nae-aruba-certified, 8320, voip, arubaos-switch,	
<input type="checkbox"/>	lag_health	8400, 6405, 6410, 6300	
<input type="checkbox"/>	mac_addr	nae-aruba-certified, 8320, 8325,	
<input type="checkbox"/>	mac_cour	rtified, arubaos-cx-min-	
<input type="checkbox"/>	neighbors	os-cx-min-10.02, 8325,	
<input type="checkbox"/>	neighbors	fied, 8320, 8325, 6300, 6	
<input type="checkbox"/>	network_I	8325, arubaos-cx-min-11	
<input type="checkbox"/>	ospfv2_interface_state_naps_impact_monitor.1.1	8320, 8325, 8400x, nae-aruba-certified, ospfv2 area	

Success

ipsla_threshold.1.0 has been successfully installed.
This change has not been saved to the startup configuration and is not permanent without copying the current running configuration to the startup configuration.

CLOSE

- Click on Scripts and select the newly installed script. Then click on “CREATE AGENT”.



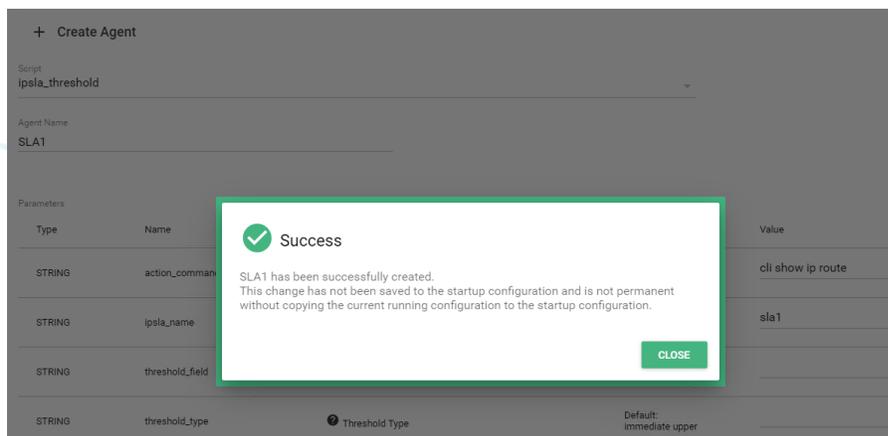
- Fill the agent parameters as below and click create.

The 'Create Agent' form is shown with the following details:

- Script:** ipsla_threshold
- Agent Name:** SLA1
- Parameters Table:**

Type	Name	Description	More Info	Value
STRING	action_command	Action Command	Default: log	cli show ip route
STRING	ipsla_name	IPSLA Session Name	Default:	sla1
STRING	threshold_field	Threshold Field	Default: average_rt	
STRING	threshold_type	Threshold Type	Default: immediate upper	
INTEGER	threshold_value	Threshold Value	Default: 2000	150
- Options:** Save running config to startup
- Buttons:** CREATE, CANCEL

- Click on close



Alternative option: install customized script

In order to demonstrate how easily any NAE script can be customized, here is a proposed alternative to install your own customized script (based on the default NAE ipsla_threshold script downloaded from ASE).

- Instead of installing the default script as explained above, download the “ipsla_theshold” script:

Installed	Name	Tags	Last Modified
<input type="checkbox"/>	interface_queues_monitor.1.0	8320, 8323, 8400x, nae-aruba-certified, interface	07/30/19 20:23:30
<input type="checkbox"/>	interface_state_stats_monitor.1.0	8400x, interface, 8320, nae-aruba-certified, link, tx, rx, port, 8325	07/30/19 03:21:01
<input type="checkbox"/>	interface_tx_rx_stats_monitor.2.2	8320, nae, 8325, nae-aruba-certified, arubaos-cx-min10.04	02/25/20 17:29:13
<input checked="" type="checkbox"/>	ipsla_threshold.1.0	arubaos, ipsla, nae-aruba-certified, 8320, voip, arubaos-switch, ar	11/21/19 15:50:14
<input type="checkbox"/>	lag_health_monitor.2.0	8400x, nae-aruba-certified, 8320, 8325, 6400, 6405, 6410, 6300, 6	06/08/20 16:39:09

If you previously installed the default script and you want to use a custom script, you can either disable the existing SLA1 NAE agent or simply delete it by going to the Analytics>Agents menu.

- Once “ipsla_threshold.py” script has been downloaded on your laptop, copy it to “ipsla_threshold-new.py” and edit it with any editor of your choice to add the following lines:

On the left side the initial script, on the right side the new modified/customized script

- Change the Version from 1.0 to 1.01 for instance

```

1 # (c) Copyright 2018 Hewlett Packard Enterprise Development LP
2 #
3 # Confidential computer software. Valid license from Hewlett Packard
4 # Enterprise required for possession, use or copying.
5 #
6 # Consistent with FAR 12.211 and 12.212, Commercial Computer Software,
7 # Computer Software Documentation, and Technical Data for Commercial Items
8 # are licensed to the U.S. Government under vendor's standard commercial
9 # license.
10
11 import re
12 import json
13 import time
14 import requests
15
16 Manifest = {
17     'Name': 'ipsla_threshold',
18     'Description': 'Monitor particular value/aggregate value of a',
19     'Action': 'SLA test and specify shell command to run as action',
20     'Version': '1.0',
21     'Author': 'Aruba Networks'
22 }
23
  
```

- Modify the **action_command** by adding these new lines after line 75 ('Default': 'log')

```

},
'traceroute_ip': {
    'Name': 'Traceroute IP Address',
    'Description': 'The Traceroute IP Address that will be tested against as\n'
    'an alert action.',
    'Type': 'string',
    'Default': '192.168.1.1'
},
'traceroute_vrf': {
    'Name': 'Traceroute VRF',
    'Description': 'The VRF which the Traceroute command will run on as\n'
    'an alert action.',
    'Type': 'string',
    'Default': 'default'
}
  
```

```

65 'action_command': {
66   'Name': 'Action Command',
67   'Description': ('The script supports 4 action commands:\n'
68                 'cli cmd" (where "cmd" is the intended CLI command)\n'
69                 '"log" (A SYSLOG message is logged when an alert '
70                 'is raised)\n"cli-log cmd" (Execute CLI command '
71                 '"cmd" and also log a SYSLOG message\n'
72                 '"schedule session_name" (Start the mentioned '
73                 'pre-configured IP SLA session)'),
74   'Type': 'string',
75   'Default': 'log'
76 }
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91 }
92
93
94 class Agent (NAE):
95   URI_PREFIX = '/rest/v1/system/ipsla_sources/'
96   URI_FIELDS_RESULT = '?attributes=sla_results.'
97   URI_STATUS = '?attributes=status.'
98   URI_STATS = '?attributes=statistics.'

```

```

65 'action_command': {
66   'Name': 'Action Command',
67   'Description': ('The script supports 4 action commands:\n'
68                 'cli cmd" (where "cmd" is the intended CLI command)\n'
69                 '"log" (A SYSLOG message is logged when an alert '
70                 'is raised)\n"cli-log cmd" (Execute CLI command '
71                 '"cmd" and also log a SYSLOG message\n'
72                 '"schedule session_name" (Start the mentioned '
73                 'pre-configured IP SLA session)'),
74   'Type': 'string',
75   'Default': 'log'
76 },
77   'traceroute_ip': {
78     'Name': 'Traceroute IP Address',
79     'Description': 'The Traceroute IP Address that will be tested against as\n'
80                   'an alert action.',
81     'Type': 'string',
82     'Default': '192.168.1.1'
83 },
84   'traceroute_vrf': {
85     'Name': 'Traceroute VRF',
86     'Description': 'The VRF which the Traceroute command will run on as\n'
87                   'an alert action.',
88     'Type': 'string',
89     'Default': 'default'
90 }
91 }
92
93
94 class Agent (NAE):
95   URI_PREFIX = '/rest/v1/system/ipsla_sources/'
96   URI_FIELDS_RESULT = '?attributes=sla_results.'
97   URI_STATUS = '?attributes=status.'
98   URI_STATS = '?attributes=statistics.'

```

- Modify the **default_actions** function by adding these new lines after line 361
(self.set_alert_level(AlertLevel.MINOR))

```
ActionCLI('traceroute ' + self.params['traceroute_ip'].value +
' vrf ' + self.params['traceroute_vrf'].value + '\n')
```

```

371 def default_actions(self):
372     session_name = self.params['ipsla_name'].value
373     self.make_report()
374     ActionCLI('show ip-sla ' + session_name + ' results')
375     self.set_alert_level(AlertLevel.MINOR)
376
377

```

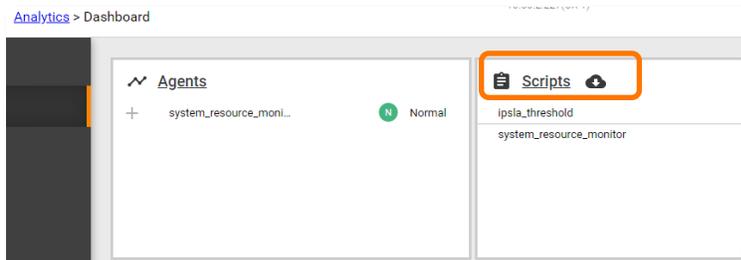
```

371 def default_actions(self):
372     session_name = self.params['ipsla_name'].value
373     self.make_report()
374     ActionCLI('show ip-sla ' + session_name + ' results')
375     self.set_alert_level(AlertLevel.MINOR)
376     ActionCLI('traceroute ' + self.params['traceroute_ip'].value +
377               ' vrf ' + self.params['traceroute_vrf'].value + '\n')

```

- Save the new script as "ipsla_threshold-new"

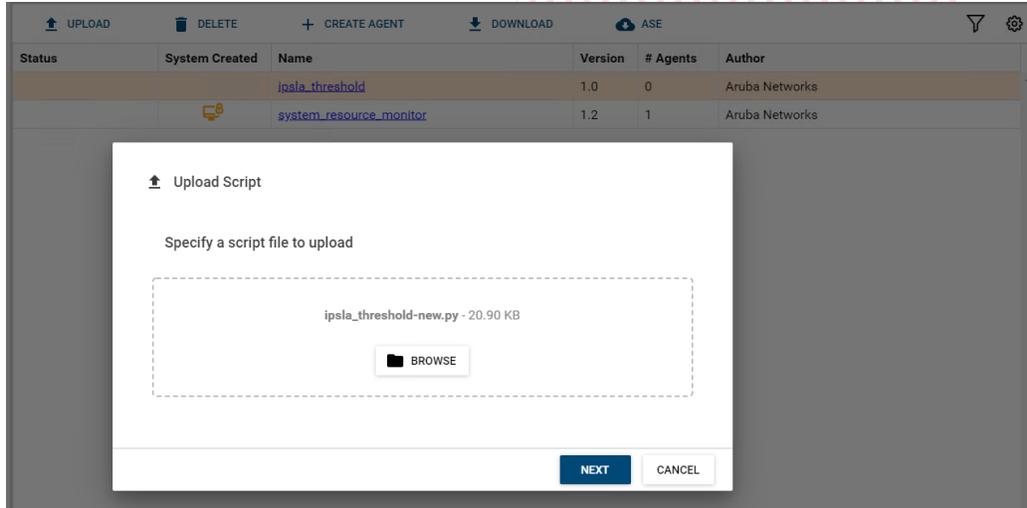
- Click on Scripts



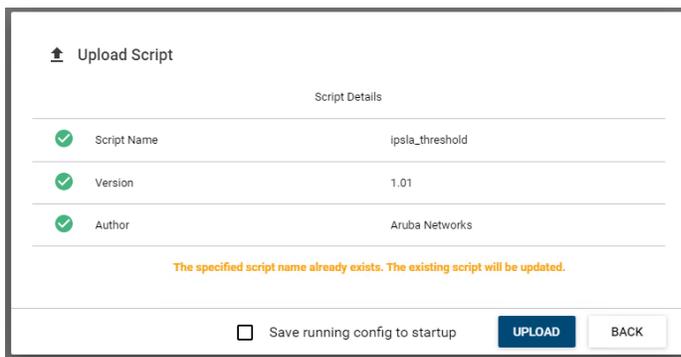
- Click on UPLOAD:



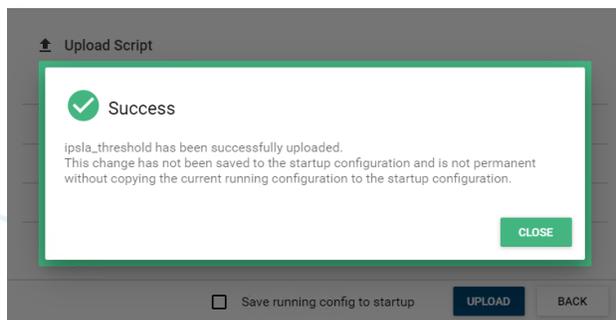
- Specify the new script file to upload and click next



- If the default script was already installed, it will get updated with this new version. Click **UPLOAD**.



- Once successfully uploaded, **CLOSE**.



- The new version should appear:

Status	System Created	Name	Version	# Agents	Author
		ipsla_threshold	1.01	0	Aruba Networks
		system_resource_monitor	1.2	1	Aruba Networks

- Create the agent as shown in default script example process, and fill the parameters as below:

+ Create Agent

Script
ipsla_threshold

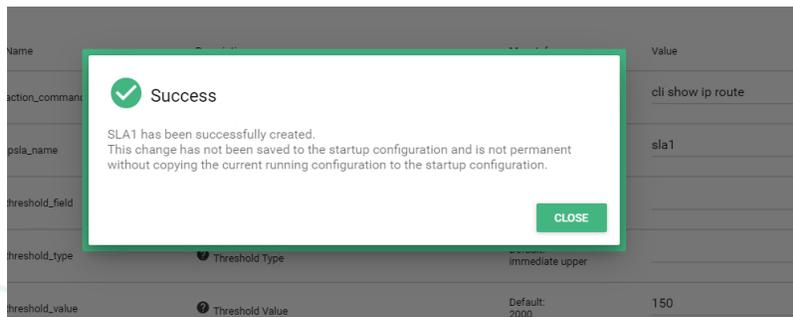
Agent Name
SLA1

Parameters

Type	Name	Description	More Info	Value
STRING	action_command	Action Command	Default: log	cli show ip route
STRING	ipsla_name	IPSLA Session Name	Default:	sla1
STRING	threshold_field	Threshold Field	Default: average_rtt	
STRING	threshold_type	Threshold Type	Default: immediate upper	
INTEGER	threshold_value	Threshold Value	Default: 2000	150
STRING	traceroute_ip	Traceroute IP Address	Default: 192.168.1.1	192.168.1.3
STRING	traceroute_vrf	Traceroute VRF	Default: default	

Save running config to startup
 CREATE
CANCEL

- Click on CLOSE



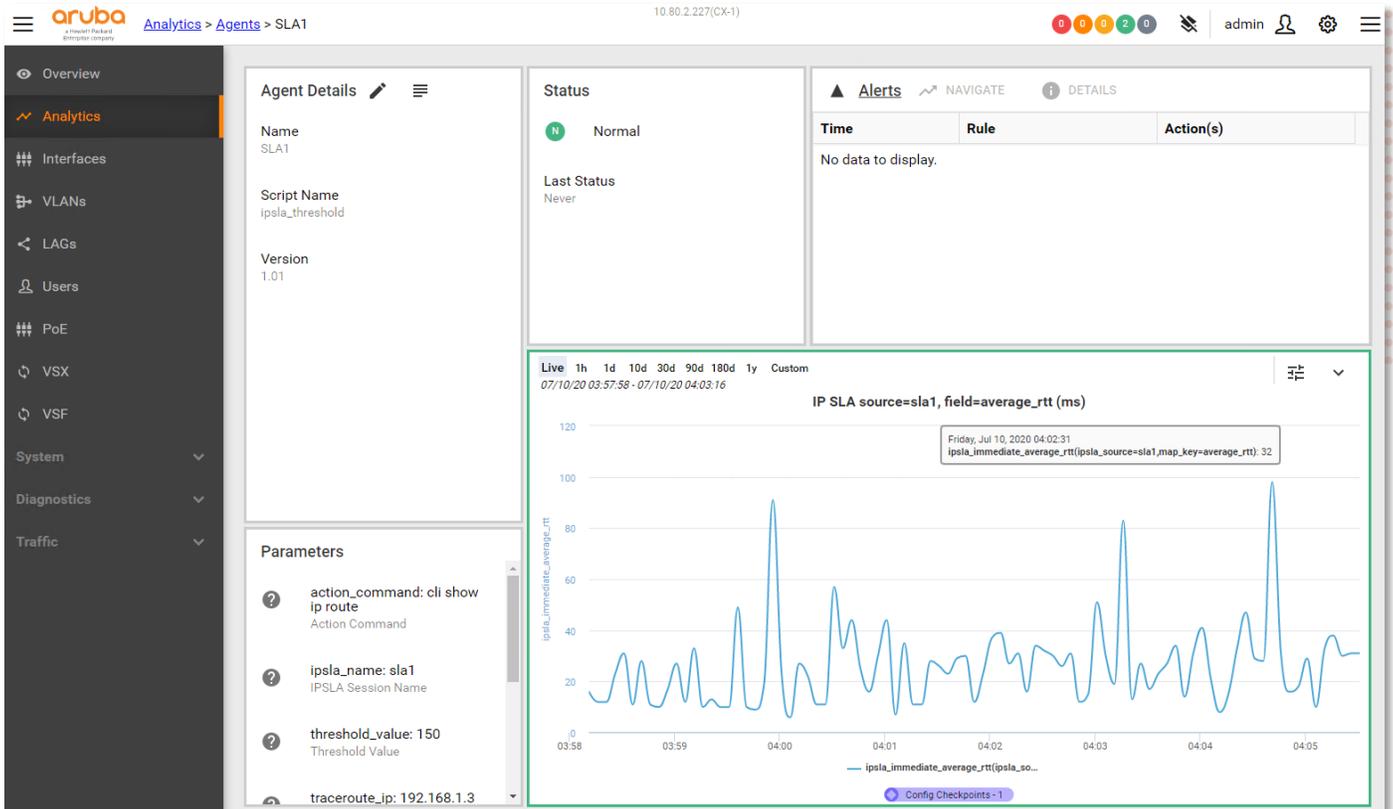
Task 5 - NAE Demonstration

Whatever the default ipsla_threshold or customized ipsla_threshold-new script is used, the following steps apply:

- From the Agents list, click on SLA1

Error	System Created	Name	Disabled	Status	Last Status
		SLA1		N Normal	Never
		sys SLA1 resource...		N Normal	11 minutes ago

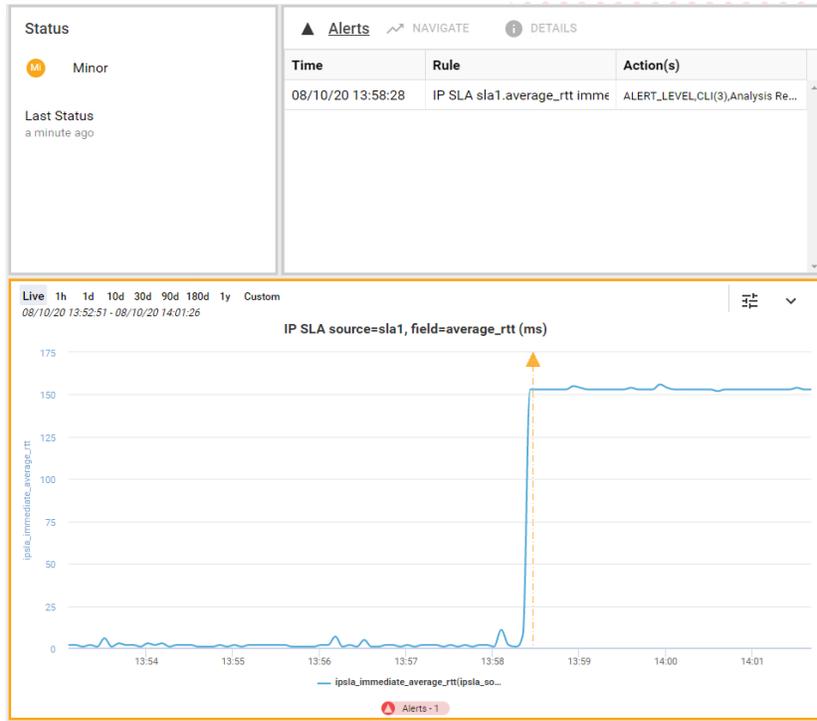
- The graph represents the average RTT reported by the ip-sla probe sla1 configured on CX1.



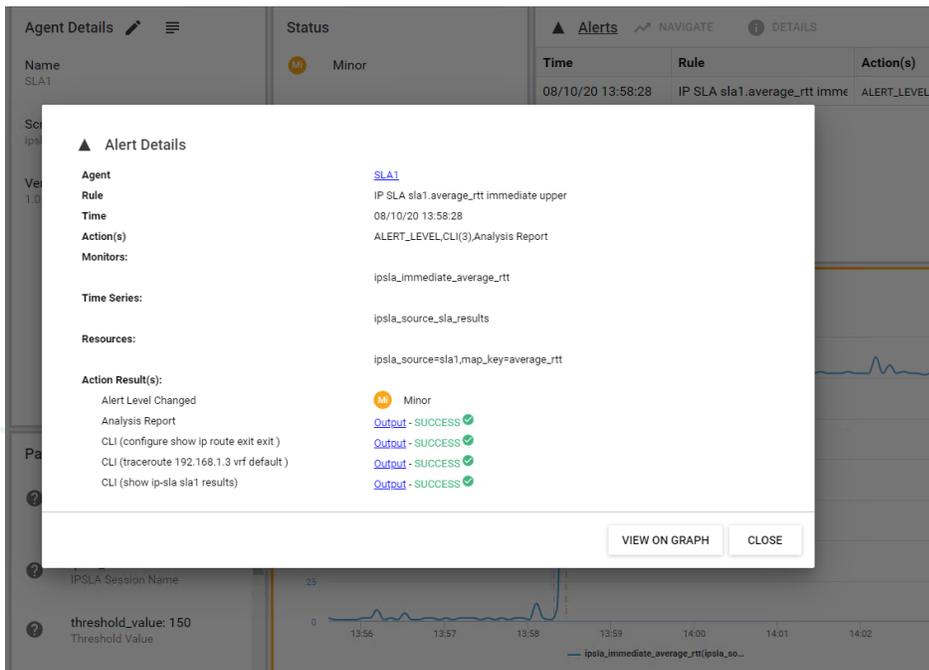
Note: your browser time/clock should be identical than the CX1 time, otherwise you may see a warning and won't be able to see Live NAE data.

- Shutdown the circuit between CX-1 and CX3, i.e. shutdown interface 1/1/2 on CX1. Traffic will get re-routed through

CX-2 and you should see an alert popping-up:



- Click on Orange triangle in the graph or select an alert on the alert list:



- Click on CLI (show ip-sla sla1 results), which provide details of measured RTT:

▲ Action Result Output

Time
08/10/20 13:58:40

✓ SUCCESS

Commands
show ip-sla sla1 results

Output

```

CX-1# show ip-sla sla1 results
IP-SLA session status
IP-SLA Name           : sla1
IP-SLA Type           : icmp-echo
Destination Host Name/IP Address : 192.168.1.3
Source IP Address/IFName      :
Status                 : running

IP-SLA Session Cumulative Counters
Total Probes Transmitted   : 580
Probes Timed-out          : 0
Send Error                 : 0
Destination Address Unreachable : 11
DNS Resolution Failures   : 0
Reception Error           : 0
Transmission Error        : 0

IP-SLA Latest Probe Results
Last Probe Time           : 2020 Aug 10 20:58:38
Packets Sent              : 1
Packets Received          : 1
Packet Loss in Test       : 0.0000%

Minimum RTT(ms)          : 153
Maximum RTT(ms)          : 153
Average RTT(ms)          : 153
DNS RTT(ms)              :
    
```

BACK CLOSE

- Click on CLI action related to previous parameters :CLI (show ip route)

▲ Action Result Output

Time
07/10/20 04:07:44

✓ SUCCESS

Commands
configure, show ip route, exit, exit,

Output

```

CX-1# configure
CX-1(config)# show ip route

Displaying ipv4 routes selected for forwarding
'[x/y]' denotes [distance/metric]

192.168.1.3/32, vrf default
  via 192.168.4.2, [110/200], ospf
192.168.4.0/30, vrf default
  via 1/1/1, [0/0], connected
192.168.4.1/32, vrf default
  via 1/1/1, [0/0], local
192.168.4.4/30, vrf default
  via 192.168.4.2, [110/200], ospf
192.168.4.8/30, vrf default
  via 1/1/2, [0/0], connected
192.168.4.9/32, vrf default
  via 1/1/2, [0/0], local

CX-1(config)# exit
CX-1# exit
    
```

BACK CLOSE

The next-hop to reach 192.168.1.3 has changed and it is now CX2 next-hop (192.168.4.2).

- For custom script, click on CLI action related to previous parameters : CLI (traceroute):

▲ Action Result Output

Time
07/10/20 04:07:35

✔ **SUCCESS**

Commands
tracert 192.168.1.3 vrf default,

Output

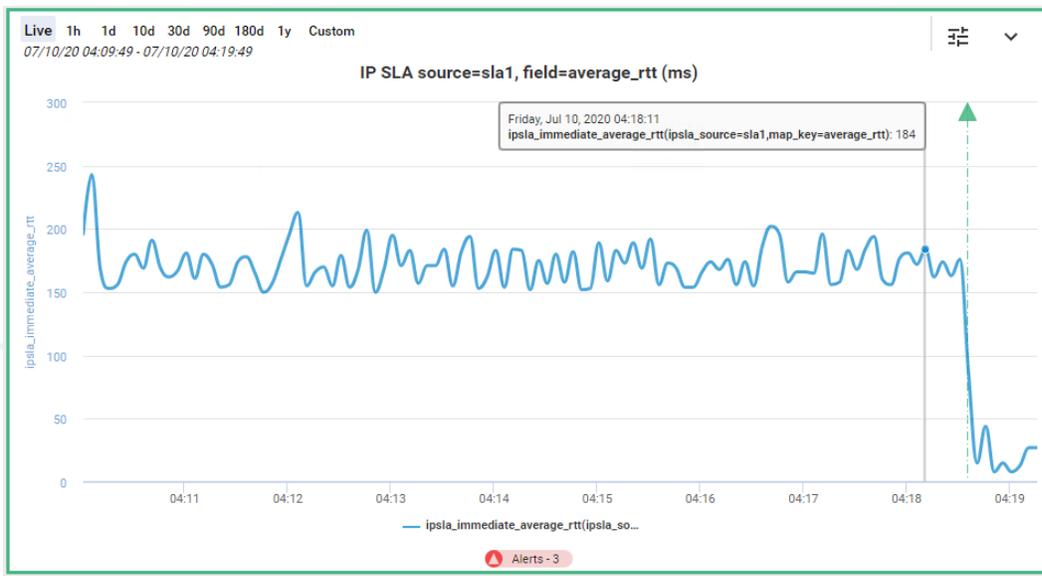
```
CX-1# traceroute 192.168.1.3 vrf default
traceroute to 192.168.1.3 (192.168.1.3), 1 hops max, 30 hops max, 3 sec. timeout, 3 probes
 1  192.168.4.2  26.753ms  7.718ms  5.992ms
 2  192.168.1.3  163.069ms  151.028ms  150.928ms
CX-1#
```

The traceroute indicates an intermediate hop that is not present in nominal situation.

DEMONSTRATION OUTCOME MESSAGING:

With these information from the NAE time-series database, the network admin can retrieve pre-computed information at the time the event/alert happened. This is extremely useful to find root cause of network incidents with better efficiency. NAE stores collected information for more than one year.

- To reset the demo, no shut interface 1/1/2 on CX1 and NAE agent graph should report latency back to normal:



This is the end of this lab.

