

Discovery 13: Troubleshoot NSO Alarms and Services

Introduction

In this activity, you will learn how to work with NSO alarms. You will inspect, handle, and resolve active alarms caused by various incidents on Cisco NSO, while logging your resolution progress.

In addition, you will learn how to observe and troubleshoot the progress of a nanoservice and resolve any issues that prevent the nanoservice from reaching a ready state.

After completing this activity, you will be able to meet these objectives:

- Inspect and resolve NSO alarms.
- Troubleshoot an NSO nanoservice.

Job Aid

The following job aid is available to help you complete the lab activities:

- This Lab Guide

The following table contains passwords that you might need.

Device	Username	Password
student-vm	student	1234QWer
nso-server	student	1234QWer

Required Resources

The following resources and equipment are required for completing the activities in this lab guide:

- PC or laptop with a web browser
- Access to the internet

Command List

The following are the most common commands that you will need:

Linux Shell:

Command	Comment
source /opt/ncs/ncs-6.1/ncsrc	Source NSO environmental variable in Docker container.
ls ll	Display contents of the current directory.
cd	Move directly to user home directory.

Command	Comment
cd ..	Exit out of current directory.
cd test	Move into the "test" folder which is a subfolder of the current directory.
cd /home/student	Move into the "nso300" folder by specifying the direct path to it starting from the root of the directory system.
ncs_cli -C	Log in to NSO CLI directly from local server.

NSO CLI:

Command	Comment
switch cli	Change CLI style.
show ?	Display all command options for current mode.
configure	Enter configuration mode.
commit	Commit new configuration (configuration mode only command).
show configuration	Display new configuration that has not yet been committed (configuration mode only command).

Makefile commands for Docker environment:

Command	Comment
make build	Builds the main NSO Docker image.
make testenv-start	Starts the NSO Docker environment.
make testenv-stop	Stops the NSO Docker environment.
make testenv-build	Recompiles and reloads the NSO packages.
make testenv-cli	Enters the NSO CLI of the NSO Docker container.
make testenv-shell	Enters the Linux shell of the NSO Docker container.
make dev-shell	Enters the Linux shell of the NSO Docker development container.

Command Syntax Reference

This lab guide uses the following conventions for **command syntax**:

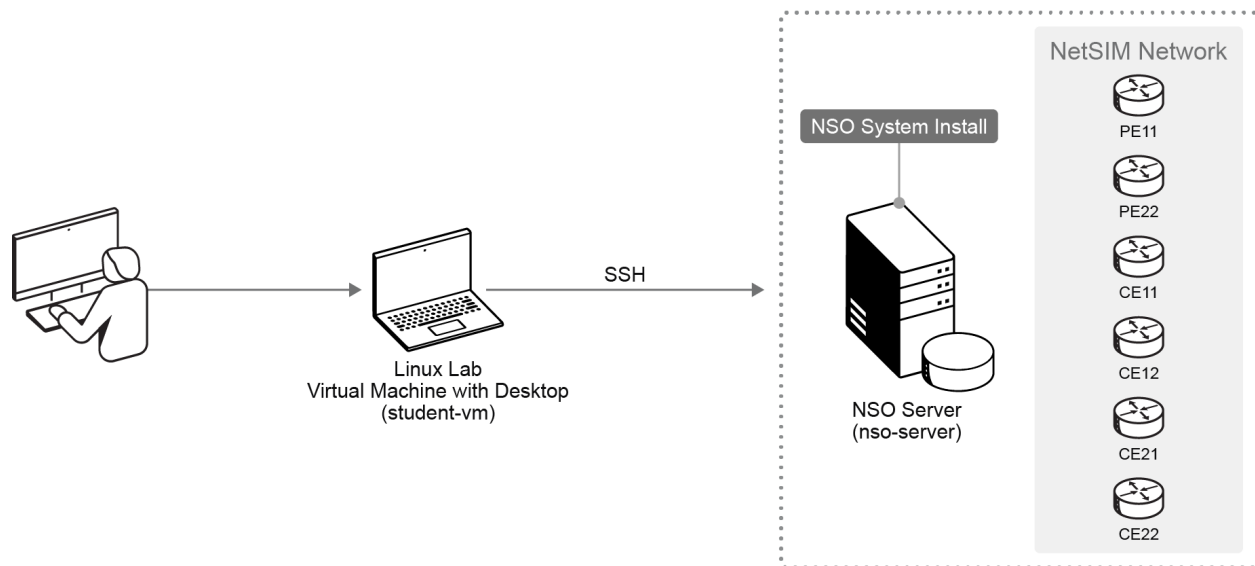
Formatting	Description and Examples
show running config	Commands in steps use this formatting.
<i>Example</i>	Type show running config
<i>Example</i>	Use the name command.
<div> <div></div> <div>show running</div> </div>	Commands in CLI outputs and configurations use this formatting.

Formatting	Description and Examples
<code>config</code>	
highlight	CLI output that is important is highlighted.
Example	<pre>student@student-vm:~\$ ncs --version 6.1</pre>
Example	Save your current configuration as the default startup config . <pre>Router Name# copy running startup</pre>
brackets ([])	Indicates optional element. You can choose one of the options.
Example:	<pre>(config-if)# frame-relay lmi-type {ansi cisco q933a}</pre>
<i>italics font</i>	Arguments for which you supply values.
Example	Open file ip tcp window-size <i>bytes</i>
angle brackets (< >)	In contexts that do not allow italics, arguments for which you supply values are enclosed in angle brackets [<>]. Do not type the brackets when entering the command.
Example	If the command syntax is ping <ip_address>, you enter ping <i>10.0.0.102</i>
string	A non-quoted set of characters. Type the characters as-is.
Example	(config)# hostname MyRouter
vertical line ()	Indicates that you enter one of the choices. The vertical line separates choices. Do not type the vertical line when entering the command.
Example	If the command syntax is show ip route arp , you enter either show ip route or show ip arp , but not both.

Lab Topology Information

Your lab session is your own personal sandbox. Whatever you do in your session will not be reflected in anyone else's session. Your lab environment is a Linux server (Student-VM) acting as a jumphost and a Linux server (NSO-server) acting as a NSO server. NSO server includes a NetSIM router. This will be the network that you will orchestrate with your NSO.

Topology



Task 1: Handle NSO Alarms

In this task, you will inspect and resolve two different NSO alarms.

Activity

Complete these steps:

Step 1

Connect to the **Student-VM**.

You can connect to the server either by choosing the **Student-VM** from the device list or by clicking on the **Student-VM** icon in the topology map.

Step 2

Open the terminal window.

Open the terminal window by clicking the **Terminal** icon in the bottom bar.

```
student@student-vm:~$
```

Step 3

Connect to the **nso-server** NSO server.

Connect to the **nso-server** NSO server with the **student** user using the SSH client. The authentication is already preconfigured with the public key authentication, therefore the password is not needed. The prompt will change, stating you are now connected to the nso-server.

```
student@student-vm:~$ ssh student@nso-server
Last login: Tue Oct  3 09:14:42 2023 from 10.0.0.102
student@nso-server:~$
```

Step 4

Copy the **netflow** package from **packages** to **/var/opt/ncs/packages** and compile it.

Use the following commands:

```
student@nso-server:~$ cp -r packages/netflow /var/opt/ncs/packages
student@nso-server:~$ make -B -C /var/opt/ncs/packages/netflow/src/
make: Entering directory '/var/opt/ncs/packages/netflow/src'
mkdir -p ../load-dir
/opt/ncs/current/bin/ncsc `ls netflow-ann.yang` > /dev/null 2>&1 &&
echo "-a netflow-ann.yang" `ls` \
      -c -o ../load-dir/netflow.fxs yang/netflow.yang
make: Leaving directory '/var/opt/ncs/packages/netflow/src'
student@nso-server:~$
```

Step 5

Connect to the NSO CLI and reload the packages.

Use the **ncs_cli -C** command to connect to the NSO CLI and the **packages reload** command to reload the packages. Verify the status of the netflow package. Reload of the package should fail.

```
student@nso-server:~$ ncs_cli -C

User student last logged in 2024-02-06T11:39:46.801246+00:00, to nso-
server, from 100.64.0.11 using cli-ssh
student connected from 100.64.0.11 using ssh on nso-server
student@ncs# packages reload

>>> System upgrade is starting.
>>> Sessions in configure mode must exit to operational mode.
>>> No configuration changes can be performed until upgrade has
completed.
>>> System upgrade has completed successfully.
reload-result {
  package cisco-ios-cli-6.85
  result true
}
reload-result {
  package cisco-iosxr-cli-7.41
  result true
}
reload-result {
  package l3mplsvpn
  result true
}
reload-result {
  package netflow
  result false
  info netflow-template.xml:2 Unknown servicepoint: netflow-export
}
student@ncs#
System message at 2024-02-06 11:42:37...
Subsystem stopped: ncs-dp-3-cisco-ios-cli-6.85:IOSDp
```

```
student@ncs#  
System message at 2024-02-06 11:42:37...  
  Subsystem started: ncs-dp-4-cisco-ios-cli-6.85:IOSDp  
student@ncs# *** ALARM package-load-failure: netflow-template.xml:2  
Unknown servicepoint: netflow-export  
student@ncs#
```

Step 6

Display and study the active alarms on NSO. Use the **show alarms** command.

You can see that two distinct alarms are active at the moment:

- A package-load-failure alarm for the NetFlow package
- A connection-failure alarm for the CE11 device

In addition to the alarm type, each alarm also stores the first occurrence and the most recent update time stamps for the alarm, alarm severity, and its state.

```
student@ncs# show alarms  
alarms summary indeterminates 0  
alarms summary criticals 1  
alarms summary majors 1  
alarms summary minors 0  
alarms summary warnings 0  
alarms alarm-list number-of-alarms 2  
alarms alarm-list last-changed 2024-02-06T11:42:37.072045+00:00  
alarms alarm-list alarm CE11 connection-failure /devices/  
device[name='CE11'] ""  
  is-cleared false  
  last-status-change 2024-02-06T11:39:52.205757+00:00  
  last-perceived-severity major  
  last-alarm-text "Failed to connect to device CE11: connection  
refused: NEDCOM CONNECT: Connection refused (Connection refused) in new  
state"  
  status-change 2024-02-06T11:39:52.205757+00:00  
  received-time 2024-02-06T11:39:52.205757+00:00  
  perceived-severity major  
  alarm-text "Failed to connect to device CE11: connection  
refused: NEDCOM CONNECT: Connection refused (Connection refused) in new  
state"  
alarms alarm-list alarm ncs package-load-failure /packages/  
package[name='netflow'] ""  
  is-cleared false  
  last-status-change 2024-02-06T11:42:37.072045+00:00  
  last-perceived-severity critical  
  last-alarm-text "netflow-template.xml:2 Unknown servicepoint:  
netflow-export"  
  status-change 2024-02-06T11:42:37.072045+00:00  
  received-time 2024-02-06T11:42:37.072045+00:00  
  perceived-severity critical  
  alarm-text "netflow-template.xml:2 Unknown servicepoint:  
netflow-export"  
student@ncs#
```

Step 7

Investigate the CE11 device failure alarm.

Use the **handle-alarm** action for the CE11 connection-failure alarm and set the state to **investigation**.

```
student@ncs# alarms alarm-list alarm CE11 connection-failure /devices/  
device[name='CE11'] "" handle-alarm description "Looking into CE11  
device configuration" state investigation  
student@ncs#
```



Tracking the resolvers and the progress of incident handling in any managed environment is important, even more so when there are multiple support personnel involved.

Step 8

Reinvestigate the CE11 alarm again. Verify the alarm state.

You can see that the **handle-alarm** action has modified the state of the alarm.

```
student@ncs# show alarms alarm-list alarm CE11  
alarms alarm-list alarm CE11 connection-failure /devices/  
device[name='CE11'] ""  
  is-cleared                false  
  last-status-change        2024-02-06T11:39:52.205757+00:00  
  last-perceived-severity   major  
  last-alarm-text           "Failed to connect to device CE11:  
connection refused: NEDCOM CONNECT: Connection refused (Connection  
refused) in new state"  
  status-change 2024-02-06T11:39:52.205757+00:00  
    received-time      2024-02-06T11:39:52.205757+00:00  
    perceived-severity major  
    alarm-text         "Failed to connect to device CE11: connection  
refused: NEDCOM CONNECT: Connection refused (Connection refused) in new  
state"  
  last-alarm-handling-change 2024-02-06T11:48:05.516408+00:00  
  alarm-handling 2024-02-06T11:48:05.516408+00:00  
    state      investigation  
    user       student  
    description "Looking into CE11 device connectivity"  
student@ncs#
```

Step 9

Exit the NSO CLI and check the status of your NetSim devices.

Use the **ncs-netsim is-alive** command. The NetSim CE11 device is not running.

```
student@ncs# exit
```

```
student@nso-server:~$ cd lab
student@nso-server:~/lab$ ncs-netsim is-alive
DEVICE CE11 FAIL
DEVICE CE12 OK
DEVICE CE21 OK
DEVICE CE22 OK
DEVICE PE11 OK
DEVICE PE22 OK
student@nso-server:~/lab$
```

Step 10

Start the **CE11** device.

Use the **ncs-netsim start CE11** command.

```
student@nso-server:~/lab$ ncs-netsim start CE11
DEVICE CE11 OK STARTED
student@nso-server:~/lab$
```

Step 11

Connect to the NSO CLI, switch the CLI mode, and perform a **sync-from** from the CE11 device.

The operation should be successful.

```
student@nso-server:~/lab$ ncs_cli -C

User student last logged in 2024-02-06T11:41:24.250223+00:00, to nso-
server, from 100.64.0.11 using cli-ssh
student connected from 100.64.0.11 using ssh on nso-server
student@ncs# devices device CE11 sync-from
result true
student@ncs#
```

Step 12

Change the state of the alarm to **closed**.

Use the **handle-alarm** action. Set the state to **closed** and enter a relevant incident description.

```
student@ncs# alarms alarm-list alarm CE11 connection-failure /devices/
device[name='CE11'] "" handle-alarm description "NetSim device was
down. Resolved." state closed
student@ncs#
```

Step 13

Display the alarm again.

Notice that the alarm was cleared when the device came back online and observe

your remark about closing the alarm.

```
student@ncs# show alarms alarm-list alarm CE11
alarms alarm-list alarm CE11 connection-failure /devices/
device[name='CE11'] ""
  is-cleared                true
  last-status-change        2024-02-06T11:54:12.757837+00:00
  last-perceived-severity    major
  last-alarm-text            "Failed to connect to device CE11:
connection refused: NEDCOM CONNECT: Connection refused (Connection
refused) in new state"
  status-change 2024-02-06T11:39:52.205757+00:00
  received-time   2024-02-06T11:39:52.205757+00:00
  perceived-severity major
  alarm-text       "Failed to connect to device CE11: connection
refused: NEDCOM CONNECT: Connection refused (Connection refused) in new
state"
  status-change 2024-02-06T11:54:12.757837+00:00
  received-time   2024-02-06T11:54:12.757837+00:00
  perceived-severity cleared
  alarm-text       "Connected as student"
  last-alarm-handling-change 2024-02-06T11:57:09.265171+00:00
  alarm-handling 2024-02-06T11:48:05.516408+00:00
  state          investigation
  user           student
  description     "Looking into CE11 device connectivity"
  alarm-handling 2024-02-06T11:57:09.265171+00:00
  state          closed
  user           student
  description     "NetSim device was down. Resolved."
student@ncs#
```

Step 14

Inspect the other remaining active alarm and study it.

By examining the alarm text, you can deduce that the XML template for the NetFlow service uses a service point that is unknown to this service and is called **netflow-export**.

```
student@ncs# show alarms alarm-list alarm ncs package-load-failure
alarms alarm-list alarm ncs package-load-failure /packages/
package[name='netflow'] ""
  is-cleared                false
  last-status-change        2024-02-06T11:42:37.072045+00:00
  last-perceived-severity    critical
  last-alarm-text            "netflow-template.xml:2 Unknown servicepoint:
netflow-export"
  status-change 2024-02-06T11:42:37.072045+00:00
  received-time   2024-02-06T11:42:37.072045+00:00
  perceived-severity critical
  alarm-text       "netflow-template.xml:2 Unknown servicepoint:
netflow-export"
student@ncs#
```

Step 15

Assign yourself as the alarm resolver and change the alarm state to **investigation**.

This action will change the alarm state to the "investigation" state.

```
student@ncs# alarms alarm-list alarm ncs package-load-failure /  
packages/package[name='netflow'] "" handle-alarm description "Fixing  
the netflow service" state investigation  
student@ncs#
```

Step 16

Exit the NSO CLI and go to the home folder.

You can use the following commands:

```
student@ncs# exit  
student@nso-server:~/lab$ cd  
student@nso-server:~$
```

Step 17

Inspect the NetFlow YANG service model.

The model is in the **~/packages/netflow/src** folder.

You can see that the YANG model defines a **netflow** servicepoint.

```
student@nso-server:~$ cat /var/opt/ncs/packages/netflow/src/yang/  
netflow.yang  
module netflow {  
  namespace "http://cisco.com/example/netflow";  
  prefix netflow;  
  
  import ietf-inet-types {  
    prefix inet;  
  }  
  import tailf-ncs {  
    prefix ncs;  
  }  
  import tailf-common {  
    prefix tailf;  
  }  
  augment /ncs:services {  
    list netflow {  
      description "Export NetFlow service";  
      key device;  
  
      uses ncs:service-data;  
      ncs:servicepoint "netflow";  
  
      leaf device {
```

```

        tailf:info "Device to export NetFlow data from";
        type leafref {
            path "/ncs:devices/ncs:device/ncs:name";
        }
    }

    leaf destination {
        tailf:info "Address to export NetFlow data to";
        type inet:ipv4-address;
    }
}
}
}
student@nso-server:~$

```

Step 18

Open and modify the NetFlow service XML template.

The XML template has an invalid servicepoint attribute. Replace the **netflow-export** with the **netflow servicepoint**.

```

student@nso-server:~$ nano /var/opt/ncs/packages/netflow/templates/
netflow-template.xml
<?xml version="1.0"?>
<config-template xmlns="http://tail-f.com/ns/config/1.0"
servicepoint="netflow">
    <devices xmlns="http://tail-f.com/ns/ncs">
        <device>
            <name>{/device}</name>
            <config>
                <ip xmlns="urn:ios">
                    <flow-export>
                        <source>
                            <GigabitEthernet>1/0</GigabitEthernet>
                        </source>
                        <version>
                            <version>5</version>
                        </version>
                        <destination>
                            <ip>{/destination}</ip>
                            <port>2055</port>
                        </destination>
                    </flow-export>
                </ip>
                <interface xmlns="urn:ios">
                    <GigabitEthernet>
                        <name>1/0</name>
                    </GigabitEthernet>
                </interface>
            </config>
        </device>
    </devices>
</config-template>
student@student-vm:~$

```

Step 19

Save the file and exit the file editor.

To exit the editor and save the file, use the **Ctrl+X** and make sure to save the modified file by answering "Yes" when saving the modified buffer.

Step 20

Enter the NSO CLI and reload the packages.

Use the **ncs_cli -C** and **packages reload** commands.

```
student@nso-server:~ $ ncs_cli -C

User student last logged in 2024-02-06T14:01:12.085217+00:00, to nso-
server, from 100.64.0.11 using cli-ssh
student connected from 100.64.0.11 using ssh on nso-server
student@ncs# packages
Possible completions:
  add      Add one or more NED packages to a running NCS instance.
  package  Show installed packages
  reload   Reload all packages
student@ncs# packages reload
reload-result {
  package cisco-ios-cli-6.85
  result true
}
reload-result {
  package cisco-iosxr-cli-7.41
  result true
}
reload-result {
  package l3mplsvpn
  result true
}
reload-result {
  package netflow
  result true
}
student@ncs#
System message at 2024-02-06 14:09:50...
  Subsystem stopped: ncs-dp-5-cisco-ios-cli-6.85:IOSDp
student@ncs#
System message at 2024-02-06 14:09:50...
  Subsystem started: ncs-dp-6-cisco-ios-cli-6.85:IOSDp
student@ncs#
```

Step 21

Close the alarm with a relevant description.

Use the **handle-alarm** command. Make sure the state is set to **"closed"**.

```
student@ncs# alarms alarm-list alarm ncs package-load-failure /
packages/package[name='netflow'] "" handle-alarm description "Fixed the
```

```
service" state closed
student@ncs#
```

Step 22

Display the alarm again.

You can see that the alarm was cleared when the package reload was successful.

```
student@ncs# show alarms alarm-list alarm ncs
alarms alarm-list alarm ncs package-load-failure /packages/
package[name='netflow'] ""
  is-cleared                true
  last-status-change        2024-02-06T14:09:49.781679+00:00
  last-perceived-severity   critical
  last-alarm-text           " netflow-template.xml:2 Unknown
servicepoint: netflow-export"
  status-change 2024-02-06T11:42:37.072045+00:00
  received-time  2024-02-06T11:42:37.072045+00:00
  perceived-severity critical
  alarm-text     "netflow-template.xml:2 Unknown servicepoint:
netflow-export"
  status-change 2024-02-06T14:09:49.781679+00:00
  received-time  2024-02-06T14:09:49.781679+00:00
  perceived-severity cleared
  last-alarm-handling-change 2024-02-06T14:10:57.33448+00:00
  alarm-handling 2024-02-06T13:37:11.527172+00:00
  state          investigation
  user           student
  description    "Fixing the netflow service"
  alarm-handling 2024-02-06T14:10:57.33448+00:00
  state          closed
  user           student
  description    "Fixed the service"
student@ncs#
```

Step 23

Display the alarm summary.

There should be 0 active alarms.

```
student@ncs# show alarms summary
alarms summary indeterminates 0
alarms summary criticals 0
alarms summary majors 0
alarms summary minors 0
alarms summary warnings 0
student@ncs#
```

Activity Verification

You have completed this task when you attain these results:

- You have inspected and successfully resolved all NSO alarms.

What is a perceived severity of a package-load-failure alarm?

- ☐ critical
- ☐ major
- ☐ minor
- ☐ warning