

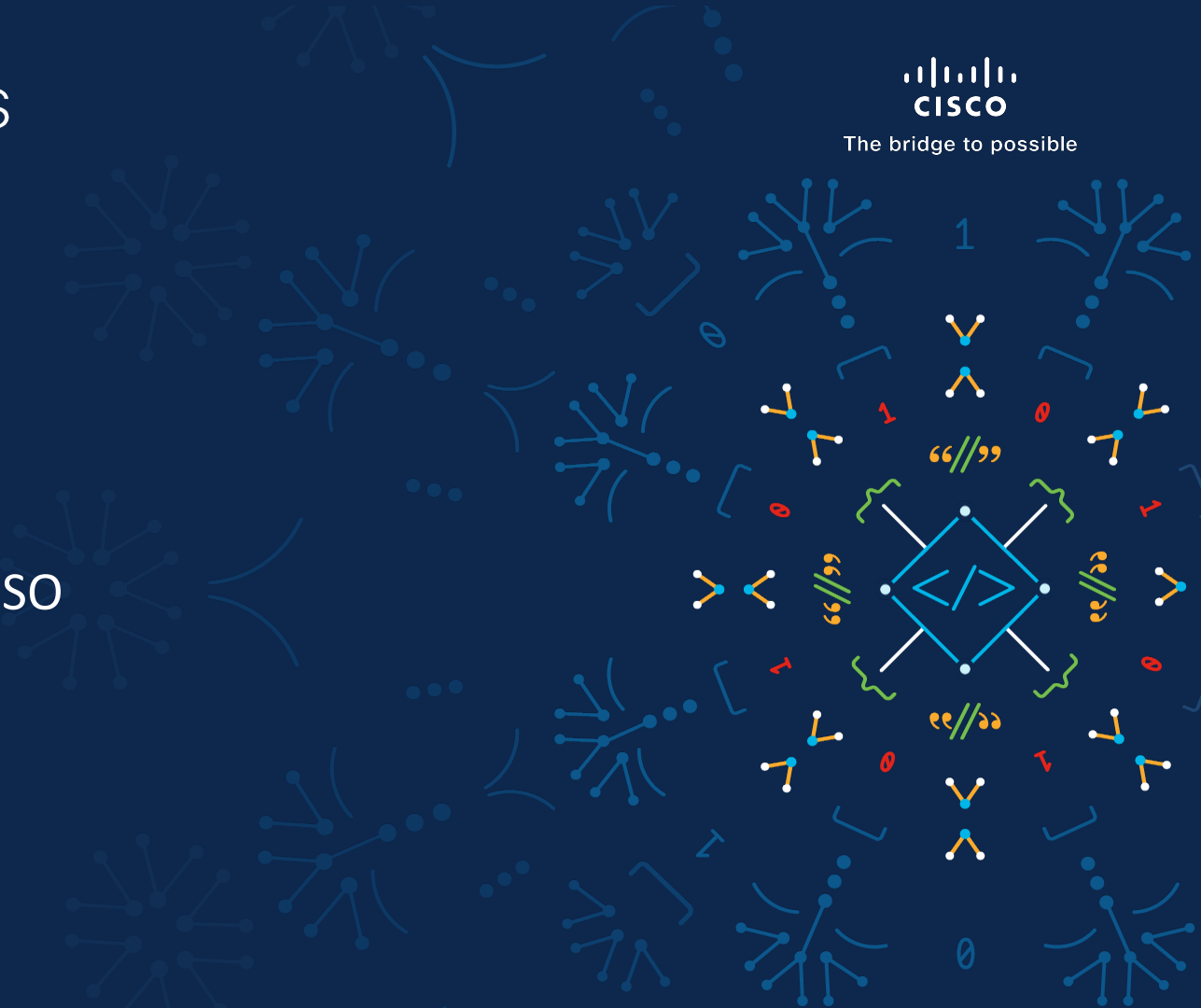
## 25 Tricks

for Developing with NSO

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# Tips & Tricks

How can we make working in NSO a little smoother?

1

## CLI

This is placeholder text. All phrases can be replaced with your own text.

2

## Command Line Tools

This is placeholder text. All phrases can be replaced with your own text.



# The CLI: More than meets the eye

```
admin@ncs# show cli
autowizard      true
complete-on-space true
devtools       false
display-level   99999999
history         100
idle-timeout    1800
ignore-leading-space false
leaf-prompting  true
output-file     terminal
paginate        true
prompt1         \u@ncs#
prompt2         \u@ncs(\m)#
screen-length   46
screen-width    146
service prompt config true
show-defaults   false
terminal        xterm-256color
timestamp       disable
```

## 1

# CLI History

- Ctrl-R – Reverse search
- show history
- clear history

```
admin@ncs(config)# show history
16:08:54 -- show history
16:26:03 -- show history
16:27:12 -- exit
16:27:58 -- show history
16:28:18 -- devices device r0 config sys syslog server
1.2.3.4
16:28:20 -- commit
16:28:21 -- tp
16:28:21 -- top
(reverse-i-search)`de': devices device r0 config sys
syslog server 1.2.3.4
```

## 2

## Prompts

- prompt1 – Operational mode
- prompt2 – Config mode

Example:

prompt1 "\u [\A] # "

prompt2 "\u [\T] \M# "

## Format Codes

\d	Date
\h	Short hostname
\H	Long hostname
\s	Client IP
\S	Client hostname
\t, \A, \T, \@	Time (24H/12h/12h AM/PM)
\u	Username
\m \m{N}	Mode name (limited to N elements)
\M \m{N}	Mode in parenthesis if any (limited to N characters)

```
NCS: /Users/vleijon/nso-5.7
```

```
vleijon@VLEIJON-M-V8CE devdays2021 % ncs_cli -u admin -C
```

```
User admin last logged in 2022-04-15T22:46:44.238519+00:00, to VLEIJON-M-V8CE, from 127.0.0.1 using cli-console
```

```
admin connected from 127.0.0.1 using console on VLEIJON-M-V8CE
```

```
admin@ncs# █
```

# 3

## Pasting Config

- autowizard false
  - Turn of prompting for mandatory fields
- complete-on-space false
  - Allow pasting config with whitespace
- load merge terminal
  - Loads from terminal in non-interactive mode

```
Example config:  
demo example  
speed 10  
interface GigE0/0  
!
```

### Normal paste:

```
admin@ncs(config)# demo example  
Value for 'interface' (<string>): speed 10  
admin@ncs(config-demo-example)#  
Possible completions:
```

### Turning off the flags:

```
admin@ncs(config)# demo example  
admin@ncs(config-demo-example)# speed 10  
admin@ncs(config-demo-example)# interface GigE0/0  
admin@ncs(config-demo-example)# !  
admin@ncs(config-demo-example)# show full  
demo example  
speed 10  
interface GigE0/0  
!
```

## 4

# Session Settings

- Available per session, per user or globally in ncs.conf

## Example:

```

user viktor
session complete-on-space false
session ignore-leading-space true
session idle-timeout 1000
session autowizard false
session devtools true
!
```

autowizard	No prompt for mandatory elements
complete-on-space	No tab-completion on space
devtools	See separate slide
display-level	Limit how deep we see in the tree
idle-timeout	When to log us out
ignore-leading-space	
paginate	Controls more
prompt1, prompt2	See separate slide
show-defaults	Show default value if different from set value



## 5

## The Hidden Chat

- See other users
- Send messages
- Forcibly log other people out
- Also available through APIs

## Session: admin

```
admin@ncs# who
Session User Context From Proto Date Mode
*107 admin cli 127.0.0.1 console 18:53:19 operational
104 viktor cli 127.0.0.1 console 18:50:46 config-terminal
admin@ncs# send crobbins Hi
Error: user crobbins not logged on
admin@ncs# send viktor Hi
Possible completions:
  session Logout a specific session
  user Logout a user from all Netconf and CLI sessions
  | Output modifiers
  <cr>
admin@ncs# logout user ?
Possible completions:
  admin admin@127.0.0.1 cli 18:53:19 (*)
  viktor viktor@127.0.0.1 cli 18:50:46
admin@ncs# logout user viktor
```

## Session: viktor

```
viktor@ncs(config-device-ex0)#
Message from admin@VLEIJON-M-V8CE at 2022-04-11 18:53:42...
Hi
viktor@ncs(config-device-ex0)#
Message from admin@VLEIJON-M-V8CE at 2022-04-11 18:54:06...
Your session has been terminated by admin
```

## 6

## Describe it!

- describe
- Extracts information about nodes
- Useful for understanding the system
- Slightly weird

```
admin@ncs(config)# describe demo
```

```
Common
```

```
Source      : YANG
Module      : demo
Namespace   : http://example.com/demo
Path        : /demo
Node        : list
Revision    : 2016-01-01
Exported agents : all
Checksum    : 8b97b79e4e9b37a39c043abf86352eb8
```

```
admin@ncs(config)# describe demo example speed
```

```
Common
```

```
Source      : YANG
Module      : demo
Namespace   : http://example.com/demo
Path        : /demo{example}/speed
Node        : leaf
Revision    : 2016-01-01
Exported agents : all
Checksum    : 8b97b79e4e9b37a39c043abf86352eb8
```

```
Type [uint16]
```

```
admin@ncs(config)# describe demo example check-sync
```

```
Common
```

```
Source      : YANG
Module      : demo
Namespace   : http://example.com/demo
Path        : /demo{example}/check-sync
Revision    : 2016-01-01
Exported agents : all
Checksum    : 8b97b79e4e9b37a39c043abf86352eb8
```

```
Type (action)
```

```
Actionpoint 'ncsinternal' : built-in
```

```
admin@ncs(config)# describe show full-configuration
```

```
Common
```

```
Source : built-in
```

```
Info
```

```
Show a parameter
```

## 7

# Config Mode

- Enter sub-modes
- Run operational commands
- Three ways to see config
  - show configuration
  - show full-configuration
  - do show running-config
- Switch modes
  - switch cli

```
admin@ncs(config-config)# pwd
Current submode path:
  devices device ios0 \ config
admin@ncs(config-config)# interface GigabitEthernet 0/0
admin@ncs(config-if)# pwd
Current submode path:
  devices device ios0 \ config \ interface GigabitEthernet 0/0
admin@ncs(config-if)# exit
admin@ncs(config-config)# pwd
Current submode path:
  devices device ios0 \ config
admin@ncs(config-config)# top
admin@ncs(config)# pwd
At top level
```

```
admin@ncs(config)# do send admin Hi
admin@ncs(config)#
Message from admin@vleijon-lab at 2022-04-13 02:58:41...
Hi
```

```
admin@ncs(config)# alias leave do logout user admin
admin@ncs(config)# show configuration alias
alias leave do logout user admin
admin@ncs(config)# show full-configuration alias
alias hi do send admin Hi
alias leave do logout user admin
admin@ncs(config)# do show running-config alias
alias hi do send admin Hi
```

- Transforms or modifies the output
- Gives you a different view on the data
- Easy way to create templates
- Applies to all show commands

## Many options

<b>annotations</b>	Display annotations
<b>curly-braces</b>	Display output as curly braces
<b>json</b>	Display output as json
<b>keypath</b>	Display output as keypath
<b>maagic</b>	Display output as Python Maagic
<b>netconf</b>	Display output as a NETCONF request
<b>prefixes</b>	Display namespace prefixes
<b>restconf</b>	Display output as restconf path
<b>service-meta-data</b>	Display service meta information
<b>tags</b>	Display tags
<b>xml</b>	Display output as XML
<b>xpath</b>	Display output as xpath

```
NCS: /Users/vleijon/nso-5.7
```

```
vleijon@VLEIJON-M-V8CE devdays2022 % ncs_cli -u admin -C
```

```
User admin last logged in 2022-04-20T00:24:38.795053+00:00, to VLEIJON-M-V8CE, from 127.0.0.1 using cli-console
```

```
admin connected from 127.0.0.1 using console on VLEIJON-M-V8CE
```

```
admin@ncs#
```

- Shows meta-data
- Let's you know which service created your data
- Helpful during service-discovery

```
admin@ncs# show running-config devices device ex2 config sys dns | display
service-meta-data
devices device ex2
config
sys dns server 10.2.3.4
!
! Refcount: 1
! Backpointer: [ /dns-config:dns-config[dns-config:name='dns-for-ex2'] ]
sys dns server 192.0.2.1
!
!
!
```

## 10

# Saving and Loading

- Quickly save and load parts of config
- Several different formats
- Three options:
  - merge
  - replace
  - override

```
admin@ncs(config)# save alias.cli alias
```

```
Saving alias
```

```
admin@ncs(config)# save alias.xml xml alias
```

```
Saving parts of the configuration.
```

```
admin@ncs(config)# load merge alias.cli
```

```
Loading.
```

```
26 bytes parsed in 0.01 sec (2.25 KiB/sec)
```

```
admin@ncs(config)# load replace alias.cli
```

```
Loading.
```

```
26 bytes parsed in 0.01 sec (2.26 KiB/sec)
```

```
admin@ncs(config)# show full-configuration alias | display json | save alias.json
```

## 11

## rload

- Relative load
- Merge a subtree repeatedly
- Schema is checked dynamically

```
if.cli
```

```
ip address dhcp  
no switchport  
no shutdown
```

```
admin@ncs(config)# devices device ios0 config interface GigabitEthernet 0/1
```

```
admin@ncs(config-if)# rload merge if.cli
```

```
Loading.
```

```
43 bytes parsed in 0.03 sec (1.20 KiB/sec)
```

```
admin@ncs(config-if)# devices device ios0 config interface GigabitEthernet 0/2
```

```
admin@ncs(config-if)# rload merge if.cli
```

```
Loading.
```

```
43 bytes parsed in 0.03 sec (1.39 KiB/sec)
```

```
admin@ncs(config-if)# top
```

```
admin@ncs(config)# show conf
```

```
devices device ios0
```

```
config
```

```
interface GigabitEthernet0/1
```

```
ip address dhcp
```

```
exit
```

```
interface GigabitEthernet0/2
```

```
no switchport
```

```
ip address dhcp
```

```
no shutdown
```

```
exit
```

```
!
```

```
!
```



- Shows default values when used with show
- Gives transaction details for commits
- Good for quick performance insights
- Works on (some) actions

```

admin@ncs(config)# commit dry-run | details
2022-04-15T10:47:15.889 applying transaction...
entering validate phase for running usid=70 tid=135
2022-04-15T10:47:15.889 grabbing transaction lock... ok (0.000 s)
2022-04-15T10:47:15.890 run transforms and transaction hooks...
2022-04-15T10:47:15.891 run pre-transform validation... ok (0.000 s)
2022-04-15T10:47:15.893 service /dns-config[name='dns-for-ex1']: run service... ok (0.009 s)
2022-04-15T10:47:15.903 run transforms and transaction hooks: ok (0.012 s)
2022-04-15T10:47:15.903 mark inactive... ok (0.000 s)
2022-04-15T10:47:15.904 pre validate... ok (0.000 s)
2022-04-15T10:47:15.904 run validation over the changeset... ok (0.000 s)
2022-04-15T10:47:15.905 run dependency-triggered validation... ok (0.000 s)
2022-04-15T10:47:15.905 check configuration policies... ok (0.000 s)
leaving validate phase for running usid=70 tid=135 (0.016 s)
entering write-start phase for running usid=70 tid=135
2022-04-15T10:47:15.906 cdb: write-start
2022-04-15T10:47:15.906 ncs-internal-service-mux: write-start
2022-04-15T10:47:15.907 check data kickers... ok (0.000 s)
leaving write-start phase for running usid=70 tid=135 (0.001 s)
entering prepare phase for running usid=70 tid=135
2022-04-15T10:47:15.907 cdb: prepare
2022-04-15T10:47:15.908 ncs-internal-device-mgr: prepare
leaving prepare phase for running usid=70 tid=135 (0.010 s)
entering abort phase for running usid=70 tid=135
2022-04-15T10:47:15.917 cdb: abort
2022-04-15T10:47:15.919 releasing transaction lock
leaving abort phase for running usid=70 tid=135 (0.001 s)
2022-04-15T10:47:15.919 applying transaction: error (0.029 s)
cli {
  local-node {
    data devices {
      device ex0 {
        config {
          sys {
            dns {
              +       # after server 10.2.3.4
              +       server 192.0.2.1;
            }
          }
        }
      }
    }
  }
  +dns-config dns-for-ex1 {
  + device [ ex0 ];
  +}
}
}

```

- Powerful transaction debugging
- Five kinds of debugging
  - | debug template
  - | debug service
  - | debug subscriber
  - | debug template
  - | debug xpath
- Works on actions and commits

admin@ncs(config)# **commit dry-run | debug template**

Evaluating `"/device"` (from file "dns-config-tpl.xml", line 4)

Context node: `/dns-config[name='dns-for-ex1']`

Result:

For `/dns-config[name='dns-for-ex1']/device[.='ex1']`, it evaluates to `"ex1"`

Operation 'merge' on existing node: `/devices/device[name='ex1']` (from file "dns-config-tpl.xml", line 4)

Evaluating `"$DNS_IP"` (from file "dns-config-tpl.xml", line 9)

Context node: `/dns-config[name='dns-for-ex1']/device[.='ex1']`

Result: `"192.0.2.1"`

Operation 'merge' on non-existing node:

`/devices/device[name='ex1']/config/r:sys/dns/server[address='192.0.2.1']` (from file "dns-config-tpl.xml", line 9)

```
cli {
  local-node {
    data devices {
      device ex1 {
        config {
          sys {
            dns {
+           # after server 10.2.3.4
+           server 192.0.2.1;
            }
          }
        }
      }
+dns-config dns-for-ex1 {
+  device [ ex1 ];
+}
    }
  }
}
```

```
NCS: /Users/vleijon/nso-5.7
```

```
vleijon@VLEIJON-M-V8CE devdays2022 % ncs_cli -u admin -C
```

```
User admin last logged in 2022-04-21T22:04:15.794157+00:00, to VLEIJON-M-V8CE, from 127.0.0.1 using cli-console
```

```
admin connected from 127.0.0.1 using console on VLEIJON-M-V8CE
```

```
admin@ncs# █
```

## 14

## Matching

- Filtering on show commands
- Can be chained

| include – match regular expression

| exclude – exclude match

| begin – match after a regex

| until – match until an expression

| context – context match

```
admin@ncs# show running-config devices device ios0 config | include "SPA.*E6"
boot system flash slot0:cat4500es8-universalk9.SPA.03.08.06.E.152-4.E6.bin
boot system flash bootflash:cat4500es8-universalk9.SPA.03.08.06.E.152-4.E6.bin
admin@ncs# show running-config devices device ios0 config interface | include "ip
address" | exclude "no ip address"
ip address 127.0.0.1 255.0.0.0
ip address 159.40.119.4 255.255.255.0
admin@ncs# show running-config devices device ios0 config interface | begin "user
port" | until service-policy
description user port
switchport
switchport mode access
no logging event link-status
service-policy output qos_large
admin@ncs# show running-config devices device ios0 config interface | context-
match "ip address \d"
devices device ios0
config
interface Loopback0
ip address 127.0.0.1 255.0.0.0
devices device ios0
config
interface Vlan1
ip address 159.40.119.4 255.255.255.0
```

# 15 Tables

- Especially useful for operational data

| tab – force table

| notab – force no table

| select – select columns

| de-select – de-select columns

| sort – sort by column

```
admin@ncs# show devices device xr live-status interfaces-state interface | select speed | select ipv4 mtu
```

NAME	SPEED	MTU
GigabitEthernet0/0/0/0	10000000000	1514
Loopback10	0	1500
MgmtEth0/RP0/CPU0/0	0	1514
Null0	0	1500

```
admin@ncs# show devices device xr live-status inventory | de-select descr
```

NAME	PID	VID	SN
0/0	R-IOXRV9000-LC-C	V01	298626ADA1D
0/0/0	PORT-1G-NIC	N/A	N/A
0/RP0	R-IOXRV9000-RP-C	V01	2D9944D8919
Rack 0	R-IOXRV9000-CC	V01	4FD9195571E

```
admin@ncs# show devices device xr live-status inventory | select vid | notab | display curly-braces
```

```
inventory 0/0 {  
  vid V01;  
}  
inventory 0/0/0 {  
  vid N/A;  
}  
inventory 0/RP0 {  
  vid V01;  
}  
inventory "Rack 0" {  
  vid V01;  
}
```

- Gives access to development tools
  - Ned-builder
  - XPath evaluation
  - timecmd
    - | display maagic
    - | display netconf
- Can be set enabled by default

```
admin@ncs# devtools true
admin@ncs# timecmd devices device xr sync-from
result true
Command executed in 6.99 sec
admin@ncs# show running-config devices device xr | de-select config | display
maagic
root.ncs__devices.device['xr'].address 172.23.80.32
root.ncs__devices.device['xr'].ssh.host-key['ecdsa-256'].key-data
"AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHAyNTYAAABBBMDjmRNgiHQ+e
oylvABy\n6nPQq6Vi26hs8OroaBeDMhggNZPi2actVY/yiGUn6CgLegU69OqcdOZwWF
d4fPy6qyQ="
root.ncs__devices.device['xr'].authgroup mygroup
root.ncs__devices.device['xr'].device-type.cli.ned-id cisco-iosxr-cli-7.38
root.ncs__devices.device['xr'].state.admin-state unlocked
```

## 17

## XPath Evaluation

- Test out XPath expressions
- Requires devtools true
- Only in config mode
  - But finds operational nodes
- Very useful for debugging
- See last year's presentation
  - <https://gitlab.com/nso-developer/xpath-example>

```

admin@ncs(config)# xpath eval count (/devices/device/child::*)
1049
admin@ncs(config)# xpath eval count(/devices/device/config/descendant::*)
12437
admin@ncs(config)# xpath eval /devices/device/config/interface/child::*[starts-
with(ipv4/address/ip,'172.')]
/devices/device[name='xr']/config/cisco-ios-
xr:interface/MgmtEth[id='0/RP0/CPU0/0']
admin@ncs(config)# xpath eval /nacm//groups/descendant::*
/nacm/groups/group[name='admin']
/nacm/groups/group[name='admin']/name :: admin
/nacm/groups/group[name='admin']/user-name :: admin
/nacm/groups/group[name='admin']/user-name :: private
/nacm/groups/group[name='oper']
/nacm/groups/group[name='oper']/name :: oper
/nacm/groups/group[name='oper']/user-name :: oper
/nacm/groups/group[name='oper']/user-name :: public

```

## 18

# Hide Groups

- Lets you hide configuration trees
- Needs to be added to YANG and to ncs.conf
- The debug group is commonly used
- tailf:hidden full hides things fully

## YANG:

```
leaf administrator {  
    type string;  
    tailf:hidden maint;  
}
```

## ncs.conf:

```
<hide-group>  
  <name>debug</name>  
</hide-group>
```

## CLI:

```
admin@ncs# show running-config kickers data-kicker  
-----^  
syntax error: element does not exist  
admin@ncs# unhide debug  
admin@ncs# show running-config kickers data-kicker  
kickers data-kicker user-change  
monitor /user  
kick-node /kickers  
action-name send-kicker-triggered  
!
```



## 19

## sync-from

- Can do some more things
- verbose – get report on missing support in the NED
- dry-run – find out what would be changed

```
admin@ncs# devices device xr sync-from verbose dry-run
```

```
cli config {  
    interface {  
+      MgmtEth 0/RP0/CPU0/0 {  
+        ipv4 {  
+          address {  
+            ip 172.23.80.32;  
+            mask 255.255.255.0;  
+          }  
+        }  
+      }  
+    }  
+  GigabitEthernet 0/0/0/0 {  
+    shutdown;  
+  }  
  }  
}
```

```
info
```

```
Number of lines parsed      : 456  
Number of lines skipped    : 1  
Skipped 1 line in context '/':  
(line 316) : 'hostname test'
```

- Did you know that NSO has a scheduler?
- Run actions on a recurring schedule
- Similar to \*NIX cronjobs

```
admin@ncs# show running-config scheduler
```

```
scheduler task sync
```

```
schedule "58 * * * *"
```

```
action-node /devices/device[name='xr0']
```

```
action-name sync-from
```

```
enabled
```

```
!
```

```
admin@ncs# show scheduler task sync
```

```
scheduler task sync
```

```
running false
```

```
history history-entry 2022-04-22T14:58:00.899121+00:00 0
```

```
duration 2.5
```

```
succeeded true
```

```
action-node /devices/device[name='xr0']
```

```
result <result xmlns='http://tail-f.com/ns/ncs'>>false</result>
```

```
<info xmlns='http://tail-f.com/ns/ncs'>External error in the
```

```
NED implementation for device xr0: Failed to enter admin mode:  
&#13;
```

```
-----^</info>
```

# Command Line Tools

- ncs-backup
- ncs-maapi
- ncs-make-package
- ncs-netsim
- ncs-project
- ncs-maapi
- ncs-start-java-vm
- ncs-start-python-vm
- ncs\_cli
- ncs\_cmd
- ncs\_load
- ncs\_pycli
- ncsc
- yanger

- Awesome for developers
- ipython based interactive NSO usage
- pip install ncs\_pycli
- [https://github.com/NSO-developer/ncs\\_pycli](https://github.com/NSO-developer/ncs_pycli)

Your maagic object 'root -> (root)' is now prepared...  
go have some fun!

trans.compare() to see your current transaction

trans.apply() to commit

trans.revert() to revert changes

Maapi object can be found at m

You can restart the transaction and create a fresh root object by invoking

new\_trans:

```
In [1]: new_trans
```

new transaction created

```
In [1]: for d in root.devices.device:
```

```
....:     print(f'Device {d}, type: {d.device_type.cli.ned_id} or  
d.device_type.netconf.ned_id')
```

```
....:
```

```
Device device, type: cisco-iosxr-nc-7.315:cisco-iosxr-nc-7.315
```

```
Device device, type: cisco-iosxr-cli-7.38:cisco-iosxr-cli-7.38
```

- Load *or* save configuration
- Handles several formats
- Warning: Check the flags carefully before loading data
  - always use `-m`

```
% ncs_load -F j -p '/nacm/groups/group{admin}'
nacm {
  groups {
    group admin {
      user-name [ admin private ];
    }
  }
}
% ncs_load -F o -p '/nacm/groups/group{admin}'
{
  "data": {
    "ietf-netconf-acm:nacm": {
      "groups": {
        "group": [
          {
            "name": "admin",
            "user-name": ["admin", "private"]
          }
        ]
      }
    }
  }
}
```

- A command line interface to the NSO APIs
- Lets you quickly verify data
- Troubleshooting and debugging
- Get help:
  - `ncs_cmd -h`
  - `ncs_cmd -h commands`

```
% ncs_cmd -c reopen_logs
```

```
% ncs_cmd -moc 'mget /devices/device{xr}/platform/version'
7.2.2
```

```
% ncs_cmd -d -moc 'mset /devices/device{xr}/platform/version 7.9.1'
```

```
mset "/devices/device{xr}/platform/version" "7.9.1"
```

```
vleijon@VLEIJON-M-V8CE snmp-service % ncs_cmd -dd -moc 'mset
/devices/device{xr}/platform/version 7.9.1'
```

```
mset "/devices/device{xr}/platform/version" "7.9.1"
```

```
TRACE Connected (maapi) to ConfD
```

```
TRACE MAAPI_START_USER_SESSION --> CONFD_OK
```

```
TRACE MAAPI_START_TRANS --> CONFD_OK
```

```
TRACE MAAPI_SET_ELEM2 /devices/device{xr}/platform/version --> CONFD_OK
```

```
TRACE MAAPI_APPLY_TRANS --> CONFD_OK
```

```
TRACE MAAPI_STOP_TRANS --> CONFD_OK
```

```
TRACE MAAPI_END_USER_SESSION --> CONFD_OK
```

```
% ncs_cmd -moc 'mget /devices/device{xr}/platform/version'
7.9.1
```

```
% ncs_cmd -mo <<HERE
```

```
heredoc> mset /devices/device{xr}/platform/version 7.9.2
```

```
heredoc> mget /devices/device{xr}/platform/version
```

```
heredoc> mset /devices/device{xr}/platform/version 7.9.3
```

```
heredoc> mget /devices/device{xr}/platform/version
```

```
heredoc> HERE
```

```
7.9.2
```

```
7.9.3
```

- The NSO YANG tool
- Can do validation and transformation
- There are other formats than tree
- The brave can create their own plugins!

```
% yanger -f tree $NCS_DIR/src/ncs/yang/taif-kicker.yang
```

```
module: taif-kicker
+--rw kickers
  +--rw data-kicker* [id]
  | +--rw id      string
  | +--rw monitor  taif:node-instance-identifier
  | +--rw trigger-expr?  yang:xpath1.0
  | +--rw trigger-type? enumeration
  | +--rw variable* [name]
  | | +--rw name  string
  | | +--rw value yang:xpath1.0
  | +--rw kick-node  union
  | +--rw action-name yang:yang-identifier
  | +--rw priority?  uint8
  | +--rw serializer?  uint8
  | +--rw filter
  |   +--rw exclude
  |     +--rw (config)?
  |       +---:(config-true)
  |         | +--rw config-true?  empty
  |       +---:(config-false)
  |         +--rw config-false?  empty
+---x send-kicker-triggered
+---w input
  +---w kicker-id?  string
  +---w path?      taif:node-instance-identifier
  +---w tid?       uint32

notifications:
+---n kicker-triggered
  +--ro kicker-id?  string
  +--ro path?      taif:node-instance-identifier
```

```
% yanger -f jstree --jstree-server localhost:8081 $NCS_DIR/src/ncs/yang/taif-kicker.yang
```

Wait for HTML to be generated

HTML generated, open localhost:8081 in your browser

- Can be accessed directly via ssh
- There are some helpful things inside the netsim directory
- The simulator can be extended

```
% ncs-netsim list
```

```
ncs-netsim list for /Users/vleijon/dev/misc/xr-real/netsim
```

```
name=xr0 netconf=12022 snmp=11022 ipc=5010 cli=10022 dir=/Users/vleijon/dev/misc/xr-real/netsim/xr/xr0
```

```
name=xr1 netconf=12023 snmp=11023 ipc=5011 cli=10023 dir=/Users/vleijon/dev/misc/xr-real/netsim/xr/xr1
```

```
% ssh -p 10022 admin@localhost
```

```
admin@localhost's password:
```

```
User admin last logged in 2022-04-22T01:00:38.786686+00:00, to VLEIJON-M-V8CE, from 127.0.0.1 using cli-ssh
```

```
admin connected from 127.0.0.1 using ssh on VLEIJON-M-V8CE
```

```
xr0# exit
```

```
Connection to localhost closed.
```

```
% ssh -p 12022 admin@localhost -s netconf
```

```
admin@localhost's password:
```

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
```

```
<capabilities>
```

```
<capability>urn:ietf:params:netconf:base:1.0</capability>
```

```
<capability>urn:ietf:params:netconf:base:1.1</capability>
```

```
<capability>urn:ietf:params:netconf:capability:candidate:1.0</capability>
```

```
<capability>urn:ietf:params:netconf:capability:validate:1.0</capability>
```

```
<capability>urn:ietf:params:netconf:capability:validate:1.1</capability>
```

```
.
```

```
.
```

```
.
```



```
NCS: /Users/vleijon/nso-5.8
vleijon@VLEIJON-M-V8CE xr-real % ncs-netsim list
ncs-netsim list for /Users/vleijon/dev/misc/xr-real/netsim

name=xr0 netconf=12022 snmp=11022 ipc=5010 cli=10022 dir=/Users/vleijon/dev/misc/xr-real/netsim/xr/xr0
name=xr1 netconf=12023 snmp=11023 ipc=5011 cli=10023 dir=/Users/vleijon/dev/misc/xr-real/netsim/xr/xr1
vleijon@VLEIJON-M-V8CE xr-real % █
```

# Summary

- CLI History
- Prompts
- Pasting Config
- Session Settings
- The Hidden Chat
- Describe it!
- Config Mode!
- | display
- | display service-meta-data
- Saving and Loading
- rload
- | details
- | debug
- Matching
- Tables
- devtools
- XPath Evaluation
- Hide Groups
- sync-from
- The Scheduler
- ncs\_pycli
- ncs\_load
- ncs\_cmd
- yanger
- netsim



The bridge to possible

Use this slide for  
transitions

*“Design is the silent  
ambassador of your brand.”*

Paul Rand