

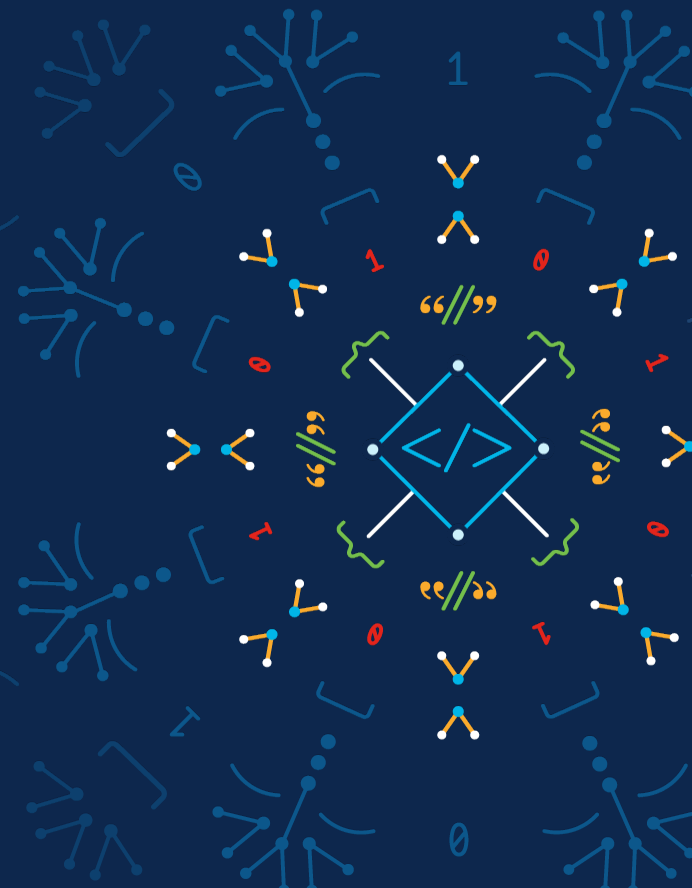
Demystifying the NED migration Process

NED Migration Utility

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Agenda

- Common Data Models (CDM)
- NED versioning
- NED Migrations
- Scenarios and issues
- NED Migration Utility

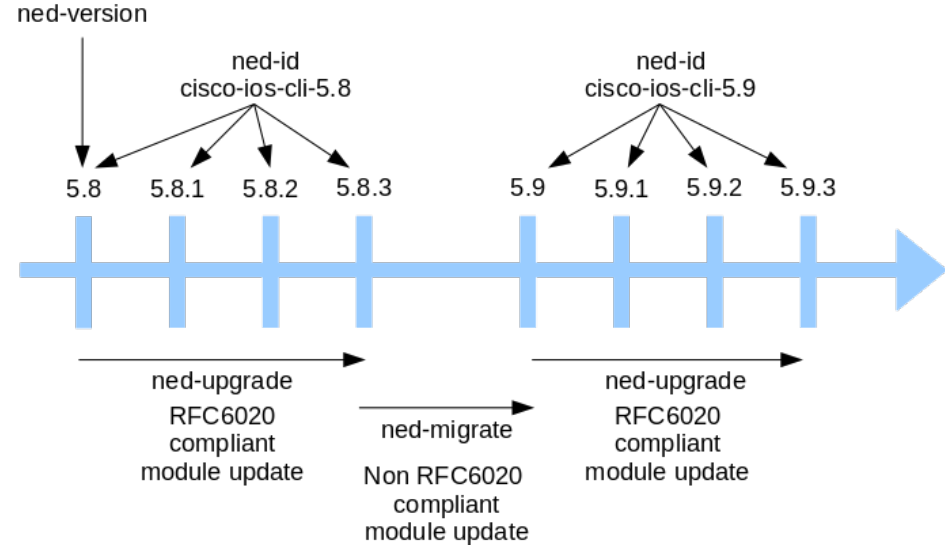
Common Data Models (CDM)



CDM

- 5.x Namespace identifier:
 - Called Crunched namespace
 - XML namespace + Mount-id
- YANG Schema Mount:
 - [RFC 8528](#)
 - Mount-id
- Unique ned-id

NED versioning



NED Migration

- Device Action
- Tool to migrate between backwards incompatible NED versions
- The action migrates all configuration and service meta-data
- Reads & writes

NED Migration

- Installing new NED package
- Checking difference:
 - Migrate dry-run
 - CHANGES files
- Update service
- NED migrate
- Redeploy if needed
- Deleting old NED package

“Do every act of your life as though it were the very last act of your life.”

Marcus Aurelius

Scenarios : Issues & Solutions

- Dry-run verbose
- Affected services
- Out of sync devices
- If-ned-id
- Yang references
- Locked devices
- Redeploying services
- Changes file
- NSO upgrades & NED migrations
- LSA

Dry-run verbose

```
absabry@nocs# devices device device-0 migrate new-ned-id cisco-ios-cli-6.79 dry-run verbose
```

```
modified-path {  
  path /ios:radius-server/vsa/send/authentication  
  info node type has changed from empty leaf to leaf  
}
```

```
modified-path {  
  path /ios:radius-server/vsa/send/accounting  
  info node type has changed from empty leaf to leaf  
}
```

```
.  
.  
.
```

```
modified-path {  
  path /ios:ptp/r-dti/clock-port/ethernet  
  info leaf/leaf-list type has changed  
}
```

```
modified-path {  
  path /ios:config-register  
  info leaf/leaf-list type has changed  
}
```

```
affected-services [ /services/simple-service:simple-service[device='device-0'] ]
```

Affected services

```
absabry@ncs# devices device device-0 migrate new-ned-id cisco-ios-cli-6.79 dry-run  
verbose
```

```
modified-path {  
  path /ios:radius-server/vsa/send/authentication  
  info node type has changed from empty leaf to leaf  
}  
modified-path {  
  path /ios:radius-server/vsa/send/accounting  
  info node type has changed from empty leaf to leaf  
}
```

```
affected-services [ /services/simple-service:simple-service[device='device-0'] ]
```

```
<radius-server xmlns="urn:ios">  
  <vsa>  
    <send>  
      <accounting />  
      <authentication />  
    </send>  
  </vsa>  
</radius-server>
```

Migration action: Reading from device

```
<DEBUG> device=device-1 show
<DEBUG> device=device-1 send NED show
<DEBUG> device=device-1 package=cisco-ios-cli-6.77 reading config
<DEBUG> device=device-1 package=cisco-ios-cli-6.77 reading config: ok (0.523 s)
<DEBUG> device=device-1 package=cisco-ios-cli-6.77 transforming input
<DEBUG> device=device-1 package=cisco-ios-cli-6.77 transforming input: ok (0.002 s)
<DEBUG> device=device-1 package=cisco-ios-cli-6.77 extended parsing
<DEBUG> device=device-1 package=cisco-ios-cli-6.77 extended parsing: ok (0.017 s)
<DEBUG> device=device-1 package=cisco-ios-cli-6.77 populating cdb
<DEBUG> device=device-1 package=cisco-ios-cli-6.77 populating cdb: ok (0.084 s)
<DEBUG> device=device-1 show: ok (0.727 s)
```

Out of sync devices: no-networking

```
absabry@ncs# devices device device-0 migrate new-ned-id cisco-ios-cli-6.79 dry-run  
verbose no-networking
```

```
modified-path {  
  path /ios:radius-server/vsa/send/authentication  
  info node type has changed from empty leaf to leaf  
}  
modified-path {  
  path /ios:radius-server/vsa/send/accounting  
  info node type has changed from empty leaf to leaf  
}
```

```
affected-services [ /services/simple-service:simple-service[device='device-0'] ]
```

```
<INFO> device=device-0 migrating  
<DEBUG> device=device-0 taking device lock  
<DEBUG> device=device-0 taking device lock: ok (0.000 s)  
<INFO> device=device-0 migrating device configuration  
<INFO> device=device-0 migrating device configuration: ok (0.015 s)  
<INFO> device=device-0 finding affected services  
<INFO> device=device-0 finding affected services: ok (0.001 s)  
<DEBUG> device=device-0 releasing device lock  
<INFO> device=device-0 migrating: ok (0.020 s)
```

If-ned-id

```
<?if-ned-id cisco-ios-cli-6.77:cisco-ios-cli-6.77?>
<interface xmlns="urn:ios">
  <GigabitEthernet>
    <name>{/intf}</name>
    <description>{/version}</description>
    <negotiation>
      <auto>true</auto>
    </negotiation>
    <duplex>full</duplex>
  </GigabitEthernet>
</interface>
```

```
absabry@ncs# services simple-service
device-0 get-modifications
cli {
  local-node {
    data
  }
}
```

Yang references

Makefile:

```
YANGPATH += ../../cisco-ios-cli-6.77/src/ncsc-out/modules/yang
```

Yang Model:

```
import tailf-ned-cisco-ios {  
    prefix ios;  
}  
...  
leaf version {  
    type leafref{  
        path "/ncs:devices/ncs:device[ncs:name=current()../device] /ncs:config/ios:version";  
    }  
}
```

NED migration:

```
modified-path {  
    path /ios:version  
    info leaf/leaf-list type has changed  
}
```

Locked devices

```
absabry@ncs# devices device device-2 migrate new-ned-id cisco-ios-cli-6.79 verbose  
dry-run
```

```
Error: Device device-2 is locked
```

```
absabry@ncs# devices device device-3 migrate new-ned-id cisco-ios-cli-6.79 verbose  
dry-run
```

```
Error: Device device-3 is southbound locked
```

```
absabry@ncs# devices device device-3 migrate new-ned-id cisco-ios-cli-6.79 dry-run  
verbose no-networking
```

```
modified-path {  
    path /ios:radius-server/vsa/send/authentication  
    info node type has changed from empty leaf to leaf  
}  
modified-path {  
    path /ios:radius-server/vsa/send/accounting  
    info node type has changed from empty leaf to leaf  
}
```


Redeploying services

It is important to re-deploy all affected services touching the device after the device migration, even though there are no backwards incompatible data model changes affecting the service. When reading the reverse/forward diffset of a service, NCS will detect changes to the NED identity of a device touched by the service and migrate the diffset on the fly. Thus the diffsets are still valid, but until the new diffset is written (typically through a re-deploy) this migration procedure will add extra time in handling the reverse/forward diffset

– ncs: NS0 does no longer require all affected services to be re-deployed

after a NED migration before removing the old NED package.

(ENG-23172, RT:40465, PS-35547, SR:688252357)

Redeploying services

```
absabry@ncs# services simple-service device-2 get-modifications
cli {
  local-node {
    data devices {
      device device-2 {
        config {
          ip {
            icmp {
              rate-limit {
                unreachable {
                  DF;
                }
              }
            }
          }
          interface {
            GigabitEthernet 0/1 {
              negotiation {
                auto true;
              }
              duplex full;
            }
          }
          radius-server {
            vsa {
              send {
                accounting;
                authentication;
              }
            }
          }
          routing-default-optimize false;
        }
      }
    }
  }
}
```

Redeploying services

```
absabry@ncs# show running-config devices device device
-2 config radius-server | display service-meta-data
devices device device-2
  config
    ! Refcount: 1
    ! Backpointer: [ /ncs:services/simple-service:simple
-service[simple-service:device='device-2'] ]
    radius-server vsa send accounting
    ! Refcount: 1
    ! Backpointer: [ /ncs:services/simple-service:simple
-service[simple-service:device='device-2'] ]
    radius-server vsa send authentication
  !
```

```
modified-path {
  path /ios:radius-server/vsa/send/authentication
  info node type has changed from empty leaf to leaf
}
modified-path {
  path /ios:radius-server/vsa/send/accounting
  info node type has changed from empty leaf to leaf
}
```

```
absabry@ncs# show running-config devices device device
-2 config radius-server | display service-meta-data
devices device device-2
  config
    radius-server vsa send accounting
    radius-server vsa send authentication
  !
  !
```

Redeploying services

```
<?if-ned-id cisco-ios-cli-6.79:cisco-ios-cli-6.79?>
<radius-server xmlns="urn:ios">
  <vsa>
    <send>
      <accounting>true</accounting>
      <authentication>true</authentication>
    </send>
  </vsa>
</radius-server>
<?end ?>
```

```
absabry@ncs# services simple-service device-2 re-deploy dry-run
cli {
}
absabry@ncs# █
```

```
absabry@ncs# show running-config devices device device-2
e-2 config radius-server | display service-meta-data
devices device device-2
config
! Refcount: 2
! Originalvalue: true
radius-server vsa send accounting
! Refcount: 2
! Originalvalue: true
radius-server vsa send authentication
!
!
absabry@ncs# █
```

Redeploying services

```
absabry@ncs# show running-config devices device device-2
config radius-server | display service-meta-data
devices device device-2
config
! Refcount: 1
radius-server vsa send accounting
! Refcount: 1
radius-server vsa send authentication
!
!
absabry@ncs# █
```

Changes file

```
ncs-run > packages > cisco-ios-cli-6.77 > ⌚ CHANGES
1- cisco-ios v6.79 [2022-03-04]
2- =====
3- Changes that might affect a package upgrade from version 6.78:
4- NOTE: The below YANG model changes are not backwards compatible:
5-
6- Incompatible nodes:
7- /radius-server/vsa/send/accounting
8- /radius-server/vsa/send/authentication
9-
10-
11- Corrections:
12-
13- - API CHANGE:
14- | radius-server vsa send accounting|authentication
15- |   Changed from type empty to type boolean due to IOS inconsiste
16- | (CISCOIOS-2362 / PS-43497 / RT48385)
17-
18- - Fixed interface order dependency, correct order is:
19- | no vrrp *
20- | no vrf forwarding
21- | (CISCOIOS-2379 / PS-43905 / RT48790)
22-
23-
```

NSO upgrades & NED migrations

1. Recompiling packages in target version
2. Upgrading NSO
3. NED migrations

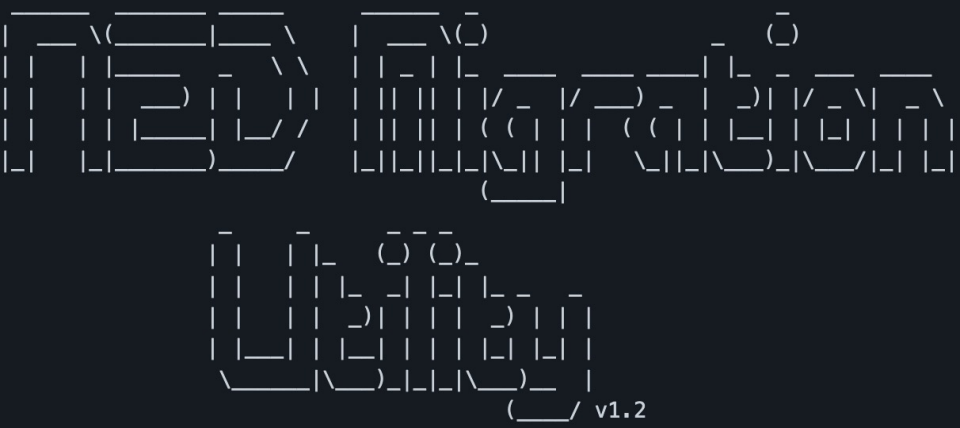
Or:

1. NED migrations
2. Upgrading NSO

LSA

- An NSO RFS is a device!
- Post NSO 5.4.x
- ned-id:
 - isa-netconf
 - cisco-nso-nc-x.y

The NED Migration Utility (NEMU)



NMU

- Batch NED migrations
- Prechecks
- Executes the "safe" migrations
- Improves visibility
- Generates migrations report

Prechecks

- Checks if devices are onboarded
- Checks if NED package is loaded
- Checks if device is already migrated
- Checks if the device is locked

Capability

- Executes ned migration of a group of devices in a dry-run verbose mode
- Shows the modified paths and their info
- Giving the possibility to handle the devices with affected services separately
- Loops over the list of the provided devices
- Records & logs every step of every migration

Demo

<https://github.com/cybot16/NED-Miration-Utility>

Q&A





The bridge to possible