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DEVLIT-4019-Quick Wins of using NSO

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DEVLIT-4019

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Barcelona | January 27-31, 2020

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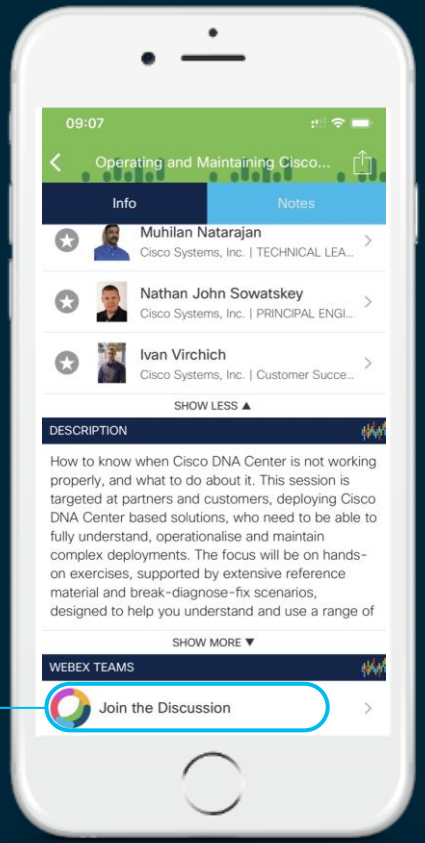

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Agenda

- Introduction NSO
- Quick Wins

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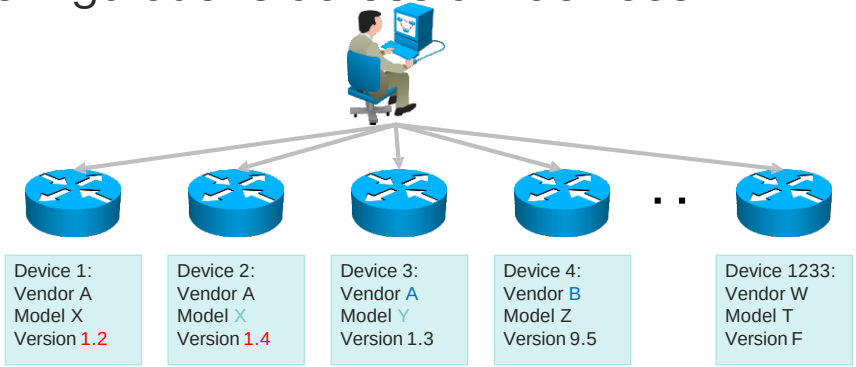
Introduction NSO

Network Management Challenges

- We are configuring **different** devices. - multi-vendor environment.
- There is no real **service** management
- There is no abstract **models** beyond device level
- Understand the capabilities and limitations of each device and device group
- Ensure consistency and reliability of configurations across all devices
- Backup and restore configurations.



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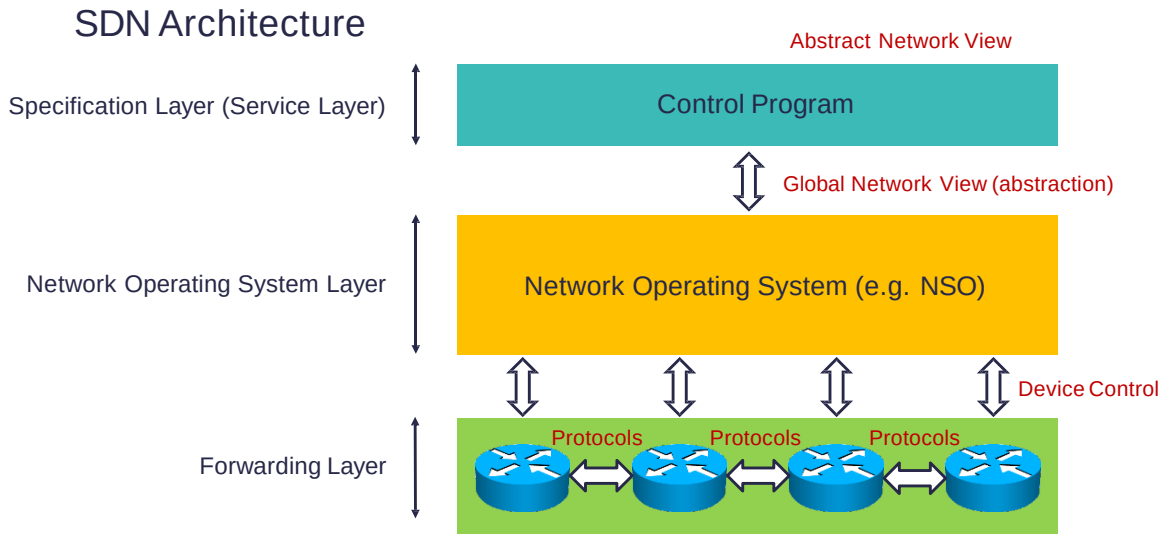
Three-Layered Architecture



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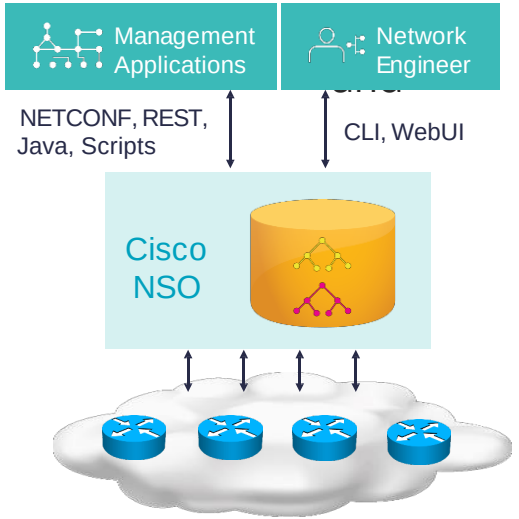
Cisco NSO Solution

- Multi-vendor service orchestration platform
- Multi-vendor service-layer SDN controller
- Supports traditional L2-L7 networking, virtual devices OpenFlow
- Provides a single API and single UI to entire managed
- Keeps accurate copy of network configuration state



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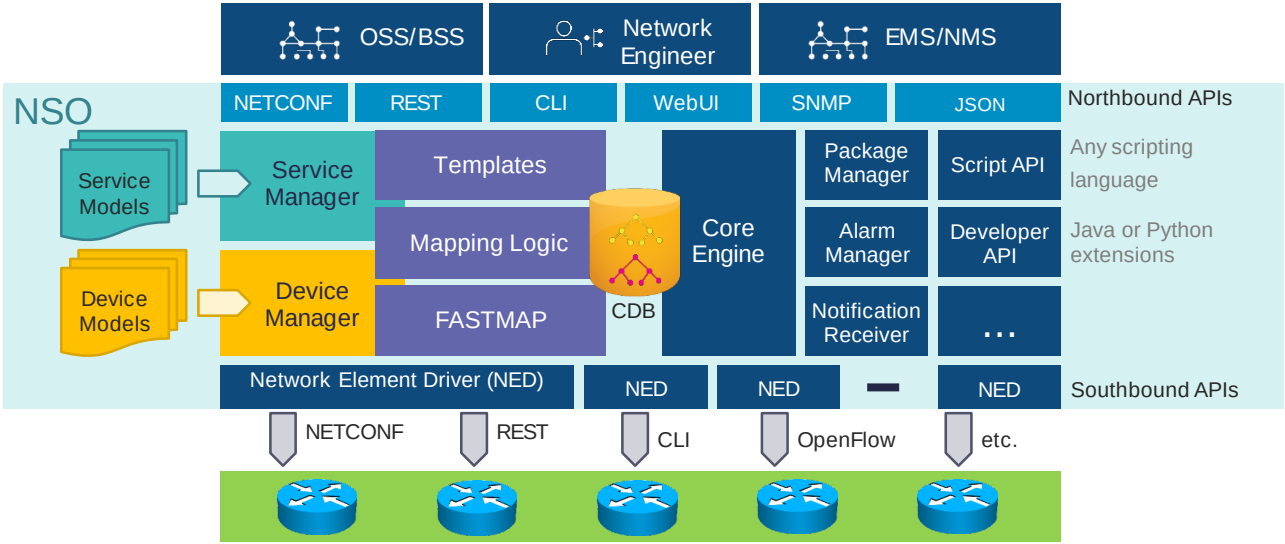
NSO Architectural Components



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Quick Wins

NSO CLI

- In Operational mode, the CLI displays operational data stored in CDB
- In Configuration mode, the CLI displays network configuration data stored in CDB

Cisco Style

```
admin@nso# operational mode CLI

admin@nso(config)# configuration mode
```

Juniper Style

```
admin@nso> operational mode CLI

admin@nso% configuration mode
```

Operational Mode

```
admin@nso# show devices list
NAME   ADDRESS   NED ID        ADMIN STATE
-----------------------------------------
P11 127.0.0.1 cisco-ios-xr unlocked  P12
127.0.0.1  cisco-ios-xr  unlocked    P21
127.0.0.1  cisco-ios-xr  unlocked    PE11
127.0.0.1   cisco-ios   unlocked     PE12
127.0.0.1   cisco-ios   unlocked     PE21
127.0.0.1  cisco-ios-xr  unlocked    PE22
127.0.0.1 cisco-ios-xr  unlocked
...
```

Configuration Mode

```
admin@nso# configure
admin@nso(config)# show full-configuration
devices device ce0

devices device PE11
 address   127.0.0.1
 port      10101
 ssh host-key ssh-dss
  key-data ...
 !
 ...
```


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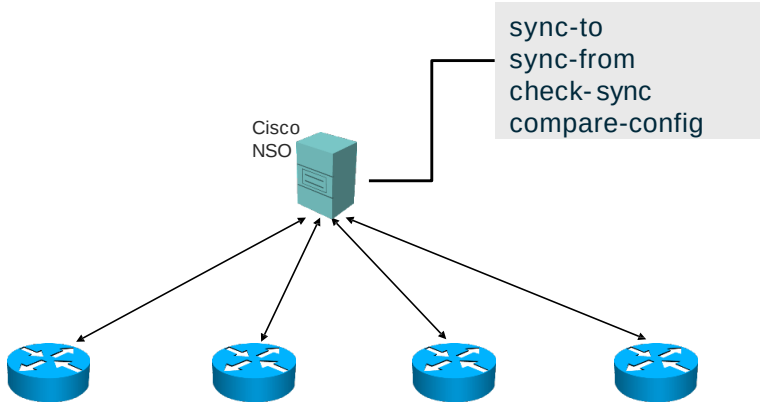
Synchronizing **from** Device

- Create Device Configuration Database.
- After initial device discovery or import, it makes sense to synchronize configurations from devices
- Current State of the Network.
- Config Backup by default.

```
admin@nso# devices sync-from

  sync-result {
     device  lb0
     result
     true
     }
```



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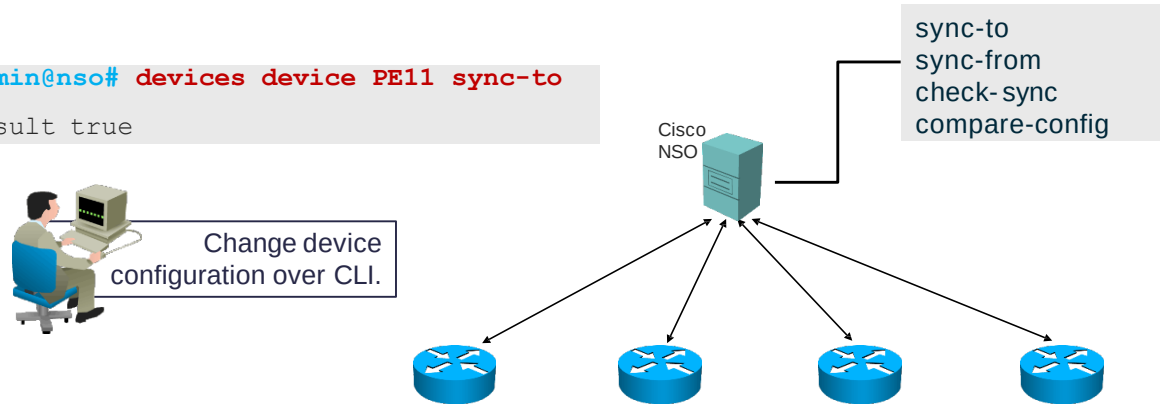
Synchronizing **to** Device

- When a device has been configured out of band
- Clears up rogue configuration
- “dry-run” option available to check changes

```
admin@nso# devices device PE11 sync-to
result true
```



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Check Sync

- Check if a device has been configured out of band

```
admin@nso# devices check-sync
sync-result {
      device PE11
      result in-
      sync
}
...
```

- Check if a subset of managed devices has been configured out of band

```
admin@nso# devices device PE1..9 check-sync
devices device PE1 check-sync
result in-sync
devices device PE2 check-sync
result in-sync
devices device PE3 check-sync
```


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Comparing Configuration

- Compare out-of-sync device configuration

```
admin@nso(config)# devices device PE11 check-sync
result out-of-sync
info got: 334bb33aae40155831edfa0b6a978f39 expected: a1424cd35da4499f6a71b3d38ae648a8

admin@nso(config)# devices device PE11 compare-config
diff
 devices {
     device PE11 {
         config {
             ios:interface {
                 Loopback 10 {
                     ip {
                         address {
                             primary {
-                                address 10.1.1.1;
+                                address 2.2.2.2;
                             }
                         }
                     }
```

"-" represents configuration items that should be deleted from the CDB in order to be the same as on the device

"+" represents configuration items that should be added to the CDB in order to be the same as on the device

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Displaying Configuration

- Display only new parts of configuration:

```
admin@nso# config
admin@nso(config)# devices device PE11 config ios:interface Loopback 20
admin@nso(config-if)# ip address 10.2.2.2 255.255.255.255
admin@nso(config)# devices device PE11 config ios:interface Loopback 30
admin@nso(config-if)# ip address 10.3.3.3 255.255.255.255
admin@nso(config-if)# show configuration
devices device PE11
 config
  ios:interface Loopback30
   ip address 10.3.3.3 255.255.255.255
   no shutdown
  exit
 !
!
admin@nso(config)#
```

Displays current configuration items in the current configuration mode

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Displaying Configuration (Cont.)

- Display only new parts of configuration:

```
admin@nso(config-if)# top
admin@nso(config)# show
configuration  devices device
PE11
 config
  ios:interface Loopback20
   ip address 10.1.1.1 255.255.255.255
   no
  shutdown
  exit
  ios:interface Loopback30
   ip address 10.3.3.3 255.255.255.255
   no shutdown
  exit
 !
!
```

Go to root of the data tree to display the all configuration items of the configuration session

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Configuring Devices

```
admin@nso# config
admin@nso(config)#
admin@nso(config)# devices device PE11 config ios:interface Loopback 20
admin@nso(config-if)# ip address 10.2.2.2 255.255.255.255
admin@nso(config)# devices device PE11 config ios:interface Loopback 30
admin@nso(config-if)# ip address 10.3.3.3 255.255.255.255
admin@nso(config-if)# commit
admin@nso#
```


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Displaying Configuration

- Display entire CDB:

```
admin@nso# show running-config
  or
admin@nso(config)# show full-configuration
```

- Display portion of CDB:

```
admin@nso# show configuration devices device PE11 config ios:interface Loopback
devices device PE11  config
  ios:interface Loopback0
   ip address 10.1.1.1 255.255.255.255
   no shutdown
...
```


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Rollbacks

```
admin@nso:~/ncs-run/logs$ ls rollback*
admin@nso:~/ncs-run/logs$ more rollback10157
```

```
admin@nso# show configuration commit 10157
devices device PE11
 config
  no ios:interface Loopback10
 !
!
admin@nso# show configuration rollback 10157
!
! Created by: admin
! Date: 2016-01-14 14:40:58
! Client: cli
!
devices device PE11
 config
  ios:interface Loopback10
   ip address 10.1.1.1 255.255.255.255
   no shutdown
```

Displays what NSO did

Displays what NSO would do if you execute a rollback

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Rollbacks – Examples

- Rollback 3 latest transactions (last change ID is 10157):

```
admin@nso(config)# rollback configuration 10155
```

- Rollback only changes done in 3rd latest transaction:

```
admin@nso(config)# rollback selective 10155
```

- Rollback interface changes on PE11 in the 3 latest transactions:

```
admin@nso(config)# rollback configuration 10155 devices device PE11 config ios:interface
```

- Rollback interface changes on PE11 in the 3rd latest transaction:

```
admin@nso(config)# rollback selective 10155 devices device PE11 config ios:interface
```


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Adding a Device

- Manually: useful for small number of devices (e.g. development and testing)
- Cloning: replicate a device from an existing device
- Templates: replicate a device from a template
- Bulk upload: useful for initial definition of many devices

```
admin@nso(config)# devices device PE101 address 10.1.1.1
admin@nso(config-device-PE101)# device-type cli ned-id cisco-ios protocol ssh
admin@nso(config-device-PE101)# authgroup default
admin@nso(config-device-PE101)# commit
Commit complete.
```


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Cloning a Device

- Devices can be instantiated from other devices
- These devices can be immediately configured
- All configuration succeeds within NSO and nothing is sent to devices (southbound-locked state!)
- All device configuration is cloned!

```
admin@nso(config)# devices device PE12 instantiate-from-other-device device-name PE11
admin@nso(config)# devices device PE13 instantiate-from-other-device device-name PE11
admin@nso(config)# devices device PE12 address 10.1.1.12
admin@nso(config)# devices device PE13 address 10.1.1.13
admin@nso(config)# commit
Commit complete.
```


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Create a Device Using Templates

- Devices can be instantiated from templates
- These devices can be immediately configured
- All configuration succeeds due to southbound-locked state
- Only template specific configuration is applied

```
admin@nso(config)# devices device www5 apply-template template-name std-web-server
admin@nso(config)# devices device www5 address 127.0.0.1 port 23456 authgroup default
admin@nso(config)# commit
```


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Cisco NSO REST/RESTCONF API

- Cisco NSO – The Network API
- Out of the Box API's.
- Service create, update, delete and all operations in NSO can be done via API.

```
cisco@nso:~$ curl -u admin:admin
http://localhost:8080/api/running/devices/device/PE11/config/ios:router/bgp?deep
<collection xmlns:y="http://tail-f.com/ns/rest">
  <bgp>
    <as-no>1</as-no>
    <bgp>
      <bestpath>
      </bestpath>
      <log-neighbor-changes/>
      <nexthop>
      </nexthop>
    </bgp>
    <distance>
    </distance>
    <neighbor>
      <id>10.0.0.101</id>
    </neighbor>
...
```

Use prefixes where needed

Use deep to display all child elements

HTTP methods:

- GET to retrieve resources
- PUT to replace resources
- POST to create resources
- DELETE to delete resources

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Cisco NSO REST API Example (Cont.)

```
cisco@nso:~$ curl -u admin:admin -H "Accept: application/vnd.yang.data+json"
http://localhost:8080/api/running/devices/device/PE11/config/ios:router/bgp?deep
{
  "tailf-ned-cisco-ios:router": {
    "bgp": [
      {
        "as-no": 1,
        "address-family": {
          "ipv4": [
            {
              "af": "unicast",
              "bgp-af": {
                "bgp": {
                  "bestpath": {
                  },
                  "nexthop": {
                  }
                }
              },
              "neighbor": [
                {
                  "id": "10.1.1.13",
                  "remote-as": "1",
                  "capability": {
                  },
                  "translate-update": {
                  }
                },
...
```

Instruct NSO to reply using JSON for data encoding

Depth options:
- Default: 5 levels
- "deep": all levels
- "shallow": 2 levels

- JSON can be used instead of XML if desired

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