NFVO Sample Migration Document

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Contents

1 Migrating NFVO Services

This document provides a sample use case to demonstrate the migration of vnf-info services from NFVO v3.7.5-migrate (Rel 2) to NFVO v4.2.1 or newer.

Note: The procedure is the same to migrate ns-info services from NFVO v3.7.5-migrate (Rel 2) to NFVO v4.2.1 or newer.

To migrate services, you must migrate service-related operational data along with the service configuration. This topic describes the procedure to perform this migration.

1.1 Prerequisites

For a successful migration, you must:

- have NSO version compatible with NFVO 4.2.x or later.
- have a NFVO v4.2.x compliant VNFD available. For a comparison of the VNFD structures between Rel 2 and NFVO v4.2.x versions, see appendix **Sample VNFD Structures** in this document.
- have a modified service code that is compliant with the NFVO v4.2.x North Bound API.
- have the Rel 2 packages compiled and loaded into NSO.
- upgrade ESC device to v5.x that is compatible with your NFVO v4.2.x.

1.2 Preparing to Migrate

This section provides information about the mapping details between Rel 2 and NFVO v4.2.x packages for vnf-info and the VNF operational data. NFVO creates this operational data based on the events received from ESC during VNF creation.

1. **vnf-info information**

   The following sample payloads provide the vnf-info information for Rel 2 and NFVO v4.2.x. The mapping table shows the vnf-info paths and the sample mapping values specified in the following XML files.

   NFVO Rel 2 vnf-info

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <nfvo xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-nfvo">
    <vnf-info>
      <esc xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-nfvo-esc">
```

```
            <vnf-deployment>
              <tenant>volvo</tenant>
              <deployment-name>branch-office</deployment-name>
              <esc>{/device}</esc>
              <username>admin</username>
              <vnf-info>
                <name>TheRouter</name>
                <vnfd>CSR1kv</vnfd>
                <vnfd-flavor>basic</vnfd-flavor>
                <instantiation-level>basic</instantiation-level>
                <vdu>
                  <id>CSR</id>
                  <managed/>
                  <image-name>CSR9.3.14.1</image-name>
                  <flavor-name>CSR9.3.14.1</flavor-name>
                  <bootup-time>300</bootup-time>
                  <recovery-wait-time>120</recovery-wait-time>
                  <day0>
                    <destination>iosxe_config.txt</destination>
                    <url>$$Provide_day0_url$$</url>
                    <variable>
                      <name>ADMIN_PWD</name>
                      <value>cisco123</value>
                    </variable>
                    <variable>
                      <name>HOSTNAME</name>
                      <value>the-router</value>
                    </variable>
                  </day0>
                  <host-key-verification-type>reject-mismatch</host-key-
verification-type>
                  <authgroup>default</authgroup>
                  <internal-connection-point>
                    <id>mgmt</id>
                    <connection-point-address>
                      <address>10.195.72.36</address>
                      <start>10.195.72.35</start>
                      <end>10.195.72.45</end>
                    </connection-point-address>
                  </internal-connection-point>
           <device-template>
                    <name>success</name>
                    <variable>
                      <name>DESCRIPTION</name>
                      <value>testing</value>
                     </variable>
                    </device-template>
                </vdu>
                <vnfd-connection-point>
                  <id>left</id>
                  <network-name>private</network-name>
                </vnfd-connection-point>
                <vnfd-connection-point>
                  <id>mgmt</id>
                  <network-name>flat-provider-network</network-name>
                </vnfd-connection-point>
                <vnfd-connection-point>
                  <id>right</id>
                  <network-name>private2</network-name>
                </vnfd-connection-point>
              </vnf-info>
```

```
        </vnf-deployment>
      </esc>
    </vnf-info>
  </nfvo>
</config>
```

NFVO v4.2.x vnf-info

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <nfv xmlns="urn:etsi:nfv:yang:etsi-nfv-descriptors">
    <vnf-info xmlns="http://cisco.com/ns/nso/cfp/cisco-etsi-nfvo">
      <name>TheRouter</name>
      <username>admin</username>
      <vnfm-type xmlns:cisco-nfvo="http://cisco.com/ns/nso/cfp/cisco-
etsi-nfvo">cisco-nfvo:netconf</vnfm-type>
      <vim-type xmlns:cisco-nfvo="http://cisco.com/ns/nso/cfp/cisco-
etsi-nfvo">cisco-nfvo:openstack</vim-type>
      <tenant>volvo</tenant>
      <vnfm>{/device}</vnfm>
      <custom-deployment-name>branch-office</custom-deployment-name>
      <vnfd>CSR1kv</vnfd>
      <vnfd-flavour>basic</vnfd-flavour>
      <instantiation-level>basic</instantiation-level>
      <vdu>
        <id>CSR</id>
        <managed/>
        <image-name>CSR9.3.14.1</image-name>
        <flavour-name>CSR9.3.14.1</flavour-name>
        <bootup-time>300</bootup-time>
        <recovery-wait-time>120</recovery-wait-time>
        <artifact>
          <id>iosxe_config.txt</id>
          <url>http://engci-maven-master.cisco.com/artifactory/vnf-
nso-snapshot/SAE/VNF-Images/CSR-kn-day0.txt</url>
          <variable>
            <name>ADMIN_PWD</name>
            <value>cisco123</value>
          </variable>
          <variable>
            <name>HOSTNAME</name>
            <value>the-router</value>
          </variable>
        </artifact>
        <host-key-verification-type>reject-mismatch</host-key-
verification-type>
        <authgroup>default</authgroup>
        <internal-connection-point>
          <id>mgmt</id>
          <connection-point-address>
            <netconf-parameters>
              <address>10.195.72.36</address>
              <ip-address-range>
                <start>10.195.72.35</start>
                <end>10.195.72.45</end>
              </ip-address-range>
            </netconf-parameters>
          </connection-point-address>
        </internal-connection-point>
  <device-template>
          <name>success</name>
            <variable>
```

```
            <name>DESCRIPTION</name>
           <value>testing</value>
         </variable>
       </device-template>
     </vdu>
     <vnfd-connection-point>
       <id>left</id>
       <network-name>private</network-name>
     </vnfd-connection-point>
     <vnfd-connection-point>
       <id>mgmt</id>
       <network-name>flat-provider-network</network-name>
     </vnfd-connection-point>
     <vnfd-connection-point>
       <id>right</id>
       <network-name>private2</network-name>
     </vnfd-connection-point>
   </vnf-info>
  </nfv>
</config>
```

The following table provides the mapping information between Rel 2 and NFVO v4.2.x.

Old vnf-info path	**New vnf-info path**	**Mapping values from sample payloads**
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/name	/nfv/vnf-info/name	TheRouter
/nfvo/vnf-info/esc/vnf-deployment/deployment-name	/nfv/vnf-info/custom-deployment-name	branch-office
/nfvo/vnf-info/esc/vnf-deployment/username	/nfv/vnf-info/username	Admin
/nfvo/vnf-info/esc/vnf-deployment/tenant	/nfv/vnf-info/tenant	Volvo
/nfvo/vnf-info/esc/vnf-deployment/esc	/nfv/vnf-info/vnfm	esc0
	/nfv/vnf-info/vnfm-type	cisco-nfvo:netconf
	/nfv/vnf-info/vim-type	cisco-nfvo:openstack
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vnfd	/nfv/vnf-info/vnfd	CSR1kv
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vnfd-flavor	/nfv/vnf-info/vnfd-flavour	Basic
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/instantiation-level	/nfv/vnf-info/instantiation-level	Basic
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/id	/nfv/vnf-info/vdu/id	CSR

/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/managed	/nfv/vnf-info/vdu/managed	
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/image-name	/nfv/vnf-info/vdu/image-name	CSR9.3.14.1
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/flavor-name	/nfv/vnf-info/vdu/flavour-name	CSR9.3.14.1
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/bootup-time	/nfv/vnf-info/vdu/bootup-time	300
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/recovery-wait-time	/nfv/vnf-info/vdu/recovery-wait-time	120
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/day0/destination	/nfv/vnf-info/vdu/artifact/id	iosxe_config.txt
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/day0/url	/nfv/vnf-info/vdu/artifact/url	http://10.147.46.245/nfvo-modelling/CSR_day0.txt
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/day0/variable/name	/nfv/vnf-info/vdu/artifact/variable/name	ADMIN_PWD HOSTNAME
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/day0/variable/value	/nfv/vnf-info/vdu/artifact/variable/value	cisco123 the-router
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/host-key-verification-type	/nfv/vnf-info/vdu/host-key-verification-type	reject-mismatch
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/authgroup	/nfv/vnf-info/vdu/authgroup	Default
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/internal-connection-point/id	/nfv/vnf-info/vdu/internal-connection-point/id	Mgmt.
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/internal-connection-point/connection-point-address/start	/nfv/vnf-info/vdu/internal-connection-point/connection-point-address/netconf-parameters/address	10.1.1.50
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/internal-connection-point/connection-point-address/start	/nfv/vnf-info/vdu/internal-connection-point/connection-point-address/netconf-parameters/ip-address-range/start	10.1.1.50
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vdu/internal-connection-point/connection-point-address/end	/nfv/vnf-info/vdu/internal-connection-point/connection-point-address/netconf-parameters/ip-address-range/end	10.1.1.60
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vnfd-connection-point/id	/nfv/vnf-info/vnfd-connection-point/id	Left mgmt right
/nfvo/vnf-info/esc/vnf-deployment/vnf-info/vnfd-connection-point/network-name	/nfv/vnf-info/vnfd-connection-point/network-name	internet mgmt volvo-internal

2. VNF Operational Data

To migrate complete services, you must migrate the operational data. The following are the operational data samples for Rel 2 and NFVO v4.2.x. The mapping table shows the operational data paths and mapping values for the sample operational data.

Rel 2 VNF Operational Data

```
admin@ncs> show nfvo vnf-info esc vnf-deployment-result
nfvo vnf-info esc vnf-deployment-result volvo branch-office esc0
 status ready 2020-03-19T23:12:15.928189-00:00
 vdu TheRouter CSR
  vm-device esc0 18611111-2119-1211-1921-157118177211
   vmname      volvo-branch-office-TheRouter-CSR-0
   index       1
   device-name volvo-branch-office-TheRouter-CSR-esc0-1
   hostid      svz-op-fdc-os-2
   hostname    host.tail-f.com
   status ready 2020-03-19T23:12:15.86945-00:00
   vm-alive
   interface 0
    type               virtual
    vim-interface-name volvo-branch-office-TheRouter-CSR-00
    port-id            dac7c69d-a7dc-4062-ad04-1c325f561fb1
    network            57ddac21-9bc3-4707-bcc1-5fddc9c9a18e
    subnet             b23a3af8-47ca-4cc0-b6b9-d7440126499b
    ip-address         127.0.0.1
    mac-address        fa:16:3e:96:91:f5
    netmask            255.255.255.0
    gateway            127.0.0.0
   interface 1
    type               virtual
    vim-interface-name volvo-branch-office-TheRouter-CSR-01
    port-id            dac7c69d-a7dc-4062-ad04-1c325f561fb1
    network            57ddac21-9bc3-4707-bcc1-5fddc9c9a18e
    subnet             b23a3af8-47ca-4cc0-b6b9-d7440126499b
    ip-address         127.0.0.1
    mac-address        fa:16:3e:96:91:f5
    netmask            255.255.255.0
    gateway            127.0.0.0
   interface 2
    type               virtual
    vim-interface-name volvo-branch-office-TheRouter-CSR-02
    port-id            dac7c69d-a7dc-4062-ad04-1c325f561fb1
    network            57ddac21-9bc3-4707-bcc1-5fddc9c9a18e
    subnet             b23a3af8-47ca-4cc0-b6b9-d7440126499b
    ip-address         127.0.0.1
    mac-address        fa:16:3e:96:91:f5
    netmask            255.255.255.0
    gateway            127.0.0.0
```

NFVO v4.2.x VNF Operational Data

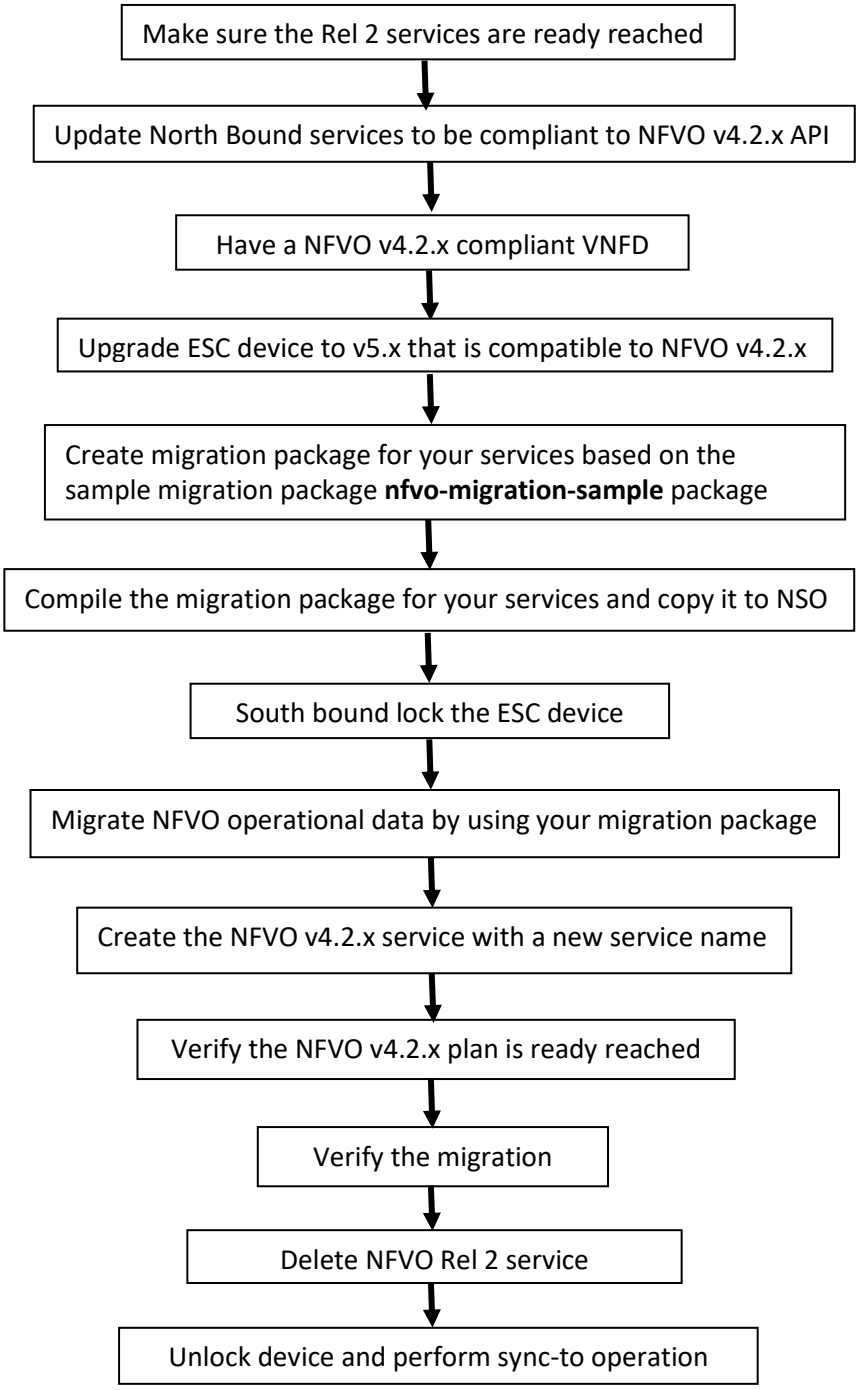
```
admin@ncs> show nfv internal netconf-deployment-result
nfv internal netconf-deployment-result branch-office
 status alive 2020-03-27T20:14:37.025804-00:00
 vm-group TheRouter-CSR
  vnf-info TheRouter
  vdu      CSR
  vm-device volvo-branch-office-TheRouter-CSR-esc0-1
   status alive 2020-03-27T18:43:49.128068+00:00
   status deployed 2020-03-27T18:43:49.090169+00:00
   id          11281211-9121-1722-4222-642511221181
   name        volvo-branch-office-TheRouter-CSR-0
   index       1
   host-id     svz-op-fdc-os-2
   hostname    host.tail-f.com
   interface 0
    type               virtual
    vim-interface-name volvo-branch-office-TheRouter-CSR-00
    port-id            dac7c69d-a7dc-4062-ad04-1c325f561fb1
    network            57ddac21-9bc3-4707-bcc1-5fddc9c9a18e
    subnet             b23a3af8-47ca-4cc0-b6b9-d7440126499b
    ip-address         127.0.0.1
    mac-address        fa:16:3e:96:91:f5
    netmask            255.255.255.0
    gateway            127.0.0.0
   interface 1
    type               virtual
    vim-interface-name volvo-branch-office-TheRouter-CSR-01
    port-id            dac7c69d-a7dc-4062-ad04-1c325f561fb1
    network            57ddac21-9bc3-4707-bcc1-5fddc9c9a18e
    subnet             b23a3af8-47ca-4cc0-b6b9-d7440126499b
    ip-address         127.0.0.1
    mac-address        fa:16:3e:96:91:f5
    netmask            255.255.255.0
    gateway            127.0.0.0
   interface 2
    type               virtual
    vim-interface-name volvo-branch-office-TheRouter-CSR-02
    port-id            dac7c69d-a7dc-4062-ad04-1c325f561fb1
    network            57ddac21-9bc3-4707-bcc1-5fddc9c9a18e
    subnet             b23a3af8-47ca-4cc0-b6b9-d7440126499b
    ip-address         127.0.0.1
    mac-address        fa:16:3e:96:91:f5
    netmask            255.255.255.0
    gateway            127.0.0.0
   netsim-port 10024
```

Old vnf-info path	Old sample value	New vnf-info path	New sample value
/nfvo/vnf-info/esc/vnf-deployment-result	volvo branch-office esc0	/nfv/internal/netconf-deployment-result	branch-office
/nfvo/vnf-info/esc/vnf-deployment-result/status	ready <timestamp>	/nfv/internal/netconf-deployment-result/status	alive <timestamp>

/nfvo/vnf-info/esc/vnf-deployment-result/vdu	TheRouter CSR	/nfv/internal/netconf-deployment-result/vm-group/name	TheRouter-CSR
		/nfv/internal/netconf-deployment-result/vm-group/vnf-info	TheRouter
		/nfv/internal/netconf-deployment-result/vm-group/vdu	CSR
/nfvo/vnf-info/esc/vnf-deployment-result/vdu/vm-device/device-name	volvo-branch-office-TheRouter-CSR-esc0-1	/nfv/internal/netconf-deployment-result/vm-group/vm-device/device-name	volvo-branch-office-TheRouter-CSR-esc0-1
TBD from plan		/nfv/internal/netconf-deployment-result/vm-group/vm-device/status	alive <timestamp> deployed <timestamp>
/nfvo/vnf-info/esc/vnf-deployment-result/vdu/vm-device	18611111-2119-1211-1921-157118177211	/nfv/internal/netconf-deployment-result/vm-group/vm-device/id	11281211-9121-1722-4222-642511221181
/nfvo/vnf-info/esc/vnf-deployment-result/vdu/vm-device/vmname	volvo-branch-office-TheRouter-CSR-0	/nfv/internal/netconf-deployment-result/vm-group/vm-device/name	volvo-branch-office-TheRouter-CSR-0
/nfvo/vnf-info/esc/vnf-deployment-result/vdu/vm-device/index	1	/nfv/internal/netconf-deployment-result/vm-group/vm-device/index	1
/nfvo/vnf-info/esc/vnf-deployment-result/vdu/vm-device/hostid	svz-op-fdc-os-2	/nfv/internal/netconf-deployment-result/vm-group/vm-device/host-id	svz-op-fdc-os-2
/nfvo/vnf-info/esc/vnf-deployment-result/vdu/vm-device/hostname	host.tail-f.com	/nfv/internal/netconf-deployment-result/vm-group/vm-device/hostname	host.tail-f.com
/nfvo/vnf-info/esc/vnf-deployment-result/vdu/vm-device/interface		/nfv/internal/netconf-deployment-result/vm-group/vm-device/interface	

1.3 Migration Workflow

The following chart shows a high-level workflow to migrate the NFVO services. For a detailed explanation and procedure, see chapter **Migrating Services from NFVO v3.7.5-migrate to NFVO v4.2.x** in this documentation.



1.4 Migrating Services from NFVO v3.7.5-migrate to NFVO v4.2.x

This procedure discusses the sequence of tasks to migrate services from Rel 2 to NFVO v4.2.x. It uses **nfvo-migration-sample** package as an example to demonstrate the migration process.

In this demonstration, migrating services from Rel 2 to NFVO v4.2.x by using the **nfvo-migration-sample** service involves the following three main tasks. Perform these tasks in the order listed.

1. Set up services in Rel 2 environment.
2. Install NFVO v4.2.x.
3. Migrate the services and verify the migration.

The following topics provide detailed procedure for each of the listed tasks.

1.4.1 Setting up Services in Rel 2 Environment

Bring up the Rel 2 environment and create the services to demonstrate the migration process from Rel 2 to NFVO v4.2.x. The **nfvo-migration-sample** service (test-csr-simulated) creates a vnf-info NFVO service. When you bring up the Rel 2 environment, it creates a CSR VNF as a managed device. It also pushes the day1 configuration on the CSR VNF through:

- the device templates in NFVO (Interface > Loopback 1 description ‘testing’) and
- the sample service directly (Interface > Loopback 2)

To set up the NFVO Rel 2 environment:

1. Copy the relevant Rel 2 templates to the **nfvo-migration-sample package**.

```
cp templates/*/rel2/* packages/nfvo-migration-sample/templates/
```

2. Compile the **nfvo-migration-sample** package by running the following command from **nfvo-migration-sample/src**.

```
make clean all
```

3. To the NSO with existing Rel 2 packages and services, copy the compiled **nfvo-migration-sample package** to the **PACKADE_DIR** folder and restart NSO with package reload option.

4. Add ESC device to the NSO device tree.

(i) Launch ncs_cli -u admin, add device to the NSO device tree, and perform a sync-from.

```
request devices fetch-ssh-host-keys
request devices device esc0 sync-from
```

(ii) From the config mode, run the following commands to load merge bootstrap data (tenant, subscription stream, VNFD, and device template):

```
load merge payloads/simulated/nfvo-esc-settings.xml
commit
set devices device esc0 config esc:esc_datamodel tenants tenant
volvo
commit
load merge payloads/*/rel2-vnf-catalogue.xml
commit

set devices template success ned-id <Cisco IOS NED-ID> config
ios:interface Loopback 1 description {$DESCRIPTION}
commit
```

5. Create a sample service. This creates a vnf-info service on NFVO.

```
set sample-service test-csr-simulated device esc0
Commit
```

6. Verify the vnf-info status for Rel2 in the plan. Once the plan is in ready-reached state, begin the migration.

```
admin@ncs% run show nfvo vnf-info esc vnf-deployment plan
NAME           TYPE  STATE     STATUS   WHEN                ref
-------------------------------------------------------------------
self           self  init      reached  2020-04-16T18:36:57  -
                     ready     reached  2020-04-16T18:37:02  -
TheRouter-CSR  vdu   init      reached  2020-04-16T18:36:57  -
                     deployed  reached  2020-04-16T18:37:01  -
                     ready     reached  2020-04-16T18:37:02  -
```

1.4.2 Installing NFVO v4.2.x

Install NFVO v4.2.x to migrate the Rel 2 services to.

To install NFVO v4.2.x:

1. Replace the Rel2 packages with the required NFVO v4.2.x packages. Make sure to keep the **tailf-etsi-rel2** package and **nfvo-migration-sample** package in NSO.

2. Update the **nfvo-migration-sample** package to be compliant with NFVO v4.2.x:

(i) Add **vnf-info.xml** template and the **sample-service-kicker.xml** template to the **nfvo-migration-sample** package. This replaces the old service templates with the new templates.

```
cp ../templates/*/rel3/* nfvo-migration-sample/templates/
```

(ii) Update python code.

```
mv nfvo-migration-sample/python/nfvo_migration_sample/main-rel3.py
nfvo-migration-sample/python/nfvo_migration_sample/main.py
```

3. Restart NSO with package reload option.

1.4.3 Migrating and Verifying the Services

Once the Rel 2 environment is ready and NFVO v4.2.x is installed, begin the migration process.

To migrate and verify the services:

1. Southbound lock the device.

```
set devices device esc0 state admin-state southbound-locked
commit
```

2. Load merge NFVO v4.2.x VNFD from the ncs_cli config mode.

```
load merge payloads/*/rel3-vnf-catalogue.xml
commit
```

3. Migrate the operational data from Rel 2 format to NFVO v4.2.x format.

```
request nfvo-migration-sample migrate-vnf-info-services
```

4. Create new sample service on NFVO v4.2.x with a new name. Do not update the existing Rel 2 service configuration during this process.

```
set sample-service test-csr-simulated-rel3 device esc0
 Commit
```

The following plan displays the final state of the services after migration.

```
show nfv vnf-info-plan
```

```
POST                                                                    POST
                    LOG                                  BACK
ACTION                    BACK                                          ACTION
NAME       FAILED  MESSAGE  ENTRY  TYPE        NAME          TRACK  GOAL  STATE
STATUS   WHEN                ref  STATUS  ID  TIME  TYPE  NAME  TRACK  GOAL  STATE
STATUS  WHEN  ref  STATUS
------------------------------------------------------------------------
TheRouter  -       -        -      self        self          false  -     init
reached  2020-04-16T19:11:10  -    -
                                                                    ready   reached
2020-04-16T19:11:53  -    -
```

```
                                    deployment  branch-office  false  -     init     reached
2020-04-16T19:11:10  -    -
                                                                          create   reached
2020-04-16T19:11:10  -    -
                                                                          ready    reached
2020-04-16T19:11:53  -    -
```

5. Once the plan is in the ready-reached state, delete the sample service created on Rel 2.

```
delete sample-service test-csr-simulated
```

6. Verify the migration is successful.

   (i) Verify the refcount is 2 for the CSR VNF and its corresponding attributes. The refcount is 1 for any configurations applied to the device from the sample service.
   For example, in the following sample output, the interface Loopback 2 is created by the sample service as a day n configuration. Therefore, the refcount is 1 for Loopback 2.

```
show devices device volvo-branch-office-TheRouter-CSR-esc0-1 |
display service-meta-data | display xml

<config xmlns="http://tail-f.com/ns/config/1.0">
  <devices xmlns="http://tail-f.com/ns/ncs">
    <device refcounter="2"  backpointer="[ /nfv:nfv/cisco-
nfvo:internal/cisco-nfvo:netconf-deployment-plan[cisco-
nfvo:id='branch-office']/cisco-nfvo:plan/cisco-
nfvo:component[cisco-nfvo:type='cisco-nfvo-nano-services:vm-
device'][cisco-nfvo:name='volvo-branch-office-TheRouter-CSR-
0']/cisco-nfvo:state[cisco-nfvo:name='cisco-nfvo-nano-
services:alive'] ]" >
      <name>volvo-branch-office-TheRouter-CSR-esc0-1</name>
      <address refcounter="2"  original-
value="0.0.0.0">127.0.0.1</address>
      <port refcounter="2"  original-value="10023">10023</port>
      <ssh>
        <host-key>
          <algorithm>ssh-rsa</algorithm>
          <key-
data>AAAAB3NzaC1yc2EAAAADAQABAAABAQCTuv26QPJCBhdyu4wrRvyK6tDmrar8wk
ZFc+DPk6tz
/hnFAchXSWhIG85u2I6a19gE+tng4izl7emEheKghFZt1rF7iSWek7phwLRlLRi74I7
j5vPF
InFHuobB1hDYBCQUaj0CZNEt9L+bPDW/oYr6UTUH5rRVFX7jNgVfW7LrrXiZw69PM/o
Lq43S
E5b9XPiswNIWBLG15U9IS7Bci5bXf8+QrkG59yNyky8RSWb1Nv8+m7l5OAGM6VBltIK
hqBXv
2sFC6BrFdVoDAAZBYT8Ax4O9oKSC4rb77VrOuaIEKzstftGn2AZT5/PlYvuGDBSul2r
IxwIX
F9RqSoYeD4RH</key-data>
        </host-key>
        <host-key-verification refcounter="2"  original-
value="reject-mismatch">reject-mismatch</host-key-verification>
      </ssh>
      <authgroup refcounter="2"  original-
value="default">default</authgroup>
      <device-type>
        <cli>
          <ned-id xmlns:cisco-ios-cli-6.7="http://tail-
f.com/ns/ned-id/cisco-ios-cli-6.7" refcounter="2"  original-
```

```
value="cisco-ios-cli-6.7:cisco-ios-cli-6.7">cisco-ios-cli-
6.7:cisco-ios-cli-6.7</ned-id>
          <protocol refcounter="2"  original-
value="ssh">ssh</protocol>
        </cli>
      </device-type>
      <state>
        <admin-state refcounter="2"  original-
value="locked">unlocked</admin-state>
      </state>
      <config>
        <interface xmlns="urn:ios">
          <Loopback>
            <name>1</name>
            <description>testing</description>
          </Loopback>
          <Loopback refcounter="1"  backpointer="[ /nfvo-migration-
sample:sample-service[nfvo-migration-sample:name='test-csr-
simulated-rel3'] ]" >
            <name>2</name>
          </Loopback>
        </interface>
      </config>
    </device>
  </devices>
</config>
```

(ii) Verify the netconf trace for the device and make sure no configuration is sent to the ESC device during the migration process.

7. Unlock the device. Compare the configurations and perform sync-to to set right the configuration differences.

```
set devices device esc0 state admin-state unlocked
commit

request devices device esc0 compare-config - This will show some
difference in the device configs which can then be synced to the
device.

request devices device esc0 sync-to
```

Migrating the services from NFVO v3.7.5-migrate to NFVO v4.2.x is now complete.

2 Appendix A: Sample VNFD Structures

This section shows a sample of the VNFD structures for Rel2 and NFVO v4.2.x packages for the CSR1kv device.

NFVO Rel 2 VNFD

```
show configuration nfvo vnfd CSR1kv | display xml
<config xmlns="http://tail-f.com/ns/config/1.0">
  <nfvo xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-nfvo">
  <vnfd>
    <id>CSR1kv</id>
    <provider>Cisco</provider>
    <product-name>CSR 1000v</product-name>
    <version>1.0</version>
    <product-info-description>Cloud router</product-info-description>
    <vdu>
      <id>CSR</id>
      <internal-connection-point-descriptor>
        <id>left</id>
        <external-connection-point-descriptor>left</external-
connection-point-descriptor>
        <interface-id xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-
nfvo-esc">1</interface-id>
      </internal-connection-point-descriptor>
      <internal-connection-point-descriptor>
        <id>mgmt</id>
        <external-connection-point-descriptor>mgmt</external-
connection-point-descriptor>
        <interface-id xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-
nfvo-esc">0</interface-id>
      </internal-connection-point-descriptor>
      <internal-connection-point-descriptor>
        <id>right</id>
        <external-connection-point-descriptor>right</external-
connection-point-descriptor>
        <interface-id xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-
nfvo-esc">2</interface-id>
      </internal-connection-point-descriptor>
      <virtual-compute-descriptor>vcd</virtual-compute-descriptor>
      <virtual-storage-descriptor>root</virtual-storage-descriptor>
      <software-image-descriptor>
        <container-format>bare</container-format>
        <disk-format>qcow2</disk-format>
        <image>http://10.147.46.245/nso-demo/csr1000v-
universalk9.03.14.01.S.155-1.S1-std.qcow2</image>
        <additional-setting xmlns="http://tail-f.com/pkg/tailf-etsi-
rel2-nfvo-esc">
          <id>disk_bus</id>
          <value>virtio</value>
        </additional-setting>
        <additional-setting xmlns="http://tail-f.com/pkg/tailf-etsi-
rel2-nfvo-esc">
          <id>e1000_net</id>
          <value>false</value>
        </additional-setting>
        <additional-setting xmlns="http://tail-f.com/pkg/tailf-etsi-
rel2-nfvo-esc">
```

```
          <id>serial_console</id>
          <value>true</value>
        </additional-setting>
        <additional-setting xmlns="http://tail-f.com/pkg/tailf-etsi-
rel2-nfvo-esc">
          <id>virtio_net</id>
          <value>false</value>
        </additional-setting>
      </software-image-descriptor>
      <device-type xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-nfvo-
esc">
        <cli>
          <ned-id>cisco-ios-cli-6.7</ned-id>
        </cli>
      </device-type>
      <day0 xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-nfvo-esc">
        <destination>iosxe_config.txt</destination>
        <mandatory/>
      </day0>
    </vdu>
    <virtual-compute-descriptor>
      <id>vcd</id>
      <virtual-memory>
        <virtual-memory-size>3.0</virtual-memory-size>
      </virtual-memory>
      <virtual-cpu>
        <number-of-virtual-cpus>1</number-of-virtual-cpus>
      </virtual-cpu>
    </virtual-compute-descriptor>
    <virtual-storage-descriptor>
      <id>root</id>
      <type-of-storage>root</type-of-storage>
      <size-of-storage>8</size-of-storage>
    </virtual-storage-descriptor>
    <external-connection-point-descriptor>
      <id>left</id>
    </external-connection-point-descriptor>
    <external-connection-point-descriptor>
      <id>mgmt</id>
      <management xmlns="http://tail-f.com/pkg/tailf-etsi-rel2-nfvo-
esc"/>
    </external-connection-point-descriptor>
    <external-connection-point-descriptor>
      <id>right</id>
    </external-connection-point-descriptor>
    <deployment-flavor>
      <id>basic</id>
      <vdu-profile>
        <vdu>CSR</vdu>
        <min-number-of-instances>1</min-number-of-instances>
        <max-number-of-instances>10</max-number-of-instances>
      </vdu-profile>
      <instantiation-level>
        <id>basic</id>
        <vdu-level>
          <vdu>CSR</vdu>
          <number-of-instances>1</number-of-instances>
        </vdu-level>
      </instantiation-level>
      <instantiation-level>
        <id>gold</id>
```

```
        <vdu-level>
          <vdu>CSR</vdu>
          <number-of-instances>4</number-of-instances>
        </vdu-level>
      </instantiation-level>
      <default-instantiation-level>basic</default-instantiation-level>
      <affinity-or-anti-affinity-group>
        <id>group_affinity_node_1</id>
        <affinity-type>affinity</affinity-type>
        <affinity-scope>nfvi-node</affinity-scope>
      </affinity-or-anti-affinity-group>
      <affinity-or-anti-affinity-group>
        <id>group_anti_affinity_node_1</id>
        <affinity-type>anti-affinity</affinity-type>
        <affinity-scope>nfvi-node</affinity-scope>
      </affinity-or-anti-affinity-group>
    </deployment-flavor>
  </vnfd>
  </nfvo>
</config>
```

NFVO v4.2.x VNFD

```
show configuration nfv vnfd CSR1kv | display xml
<config xmlns="http://tail-f.com/ns/config/1.0">
  <nfv xmlns="urn:etsi:nfv:yang:etsi-nfv-descriptors">
  <vnfd>
    <id>CSR1kv</id>
    <provider>Cisco</provider>
    <product-name>CSR 1000v</product-name>
    <software-version>1.0</software-version>
    <version>1.0</version>
    <vnfm-info>netconf</vnfm-info>
    <vdu>
      <id>CSR</id>
      <name>somename</name>
      <int-cpd>
        <id>left</id>
        <layer-protocol>ipv4</layer-protocol>
        <interface-id xmlns="http://cisco.com/ns/nso/cfp/cisco-etsi-
nfvo">1</interface-id>
      </int-cpd>
      <int-cpd>
        <id>mgmt</id>
        <layer-protocol>ipv4</layer-protocol>
        <interface-id xmlns="http://cisco.com/ns/nso/cfp/cisco-etsi-
nfvo">0</interface-id>
        <management xmlns="http://cisco.com/ns/nso/cfp/cisco-etsi-
nfvo"/>
      </int-cpd>
      <int-cpd>
        <id>right</id>
        <layer-protocol>ipv4</layer-protocol>
        <interface-id xmlns="http://cisco.com/ns/nso/cfp/cisco-etsi-
nfvo">2</interface-id>
      </int-cpd>
      <virtual-compute-desc>vcd</virtual-compute-desc>
      <virtual-storage-desc>root</virtual-storage-desc>
      <sw-image-desc>csr</sw-image-desc>
```

```
      <device-type xmlns="http://cisco.com/ns/nso/cfp/cisco-etsi-
nfvo">
        <cli>
          <ned-id>cisco-ios-cli-6.7:cisco-ios-cli-6.7</ned-id>
        </cli>
      </device-type>
      <artifact xmlns="http://cisco.com/ns/nso/cfp/cisco-etsi-
nfvo">test</artifact>
    </vdu>
    <virtual-compute-desc>
      <id>vcd</id>
      <virtual-memory>
        <size>3.0</size>
      </virtual-memory>
      <virtual-cpu>
        <num-virtual-cpu>1</num-virtual-cpu>
      </virtual-cpu>
    </virtual-compute-desc>
    <virtual-storage-desc>
      <id>root</id>
      <type-of-storage>root-storage</type-of-storage>
      <size-of-storage>8</size-of-storage>
    </virtual-storage-desc>
    <sw-image-desc>
      <id>csr</id>
      <name>somename</name>
      <version>1.0</version>
      <checksum>
        <algorithm>sha-256</algorithm>
        <hash>123321</hash>
      </checksum>
      <container-format>bare</container-format>
      <disk-format>qcow2</disk-format>
      <min-disk>2</min-disk>
      <size>2</size>
      <image>http://10.147.46.245/nso-demo/csr1000v-
universalk9.03.14.01.S.155-1.S1-std.qcow2</image>
      <additional-setting xmlns="http://cisco.com/ns/nso/cfp/cisco-
etsi-nfvo">
        <id>disk_bus</id>
        <value>virtio</value>
      </additional-setting>
      <additional-setting xmlns="http://cisco.com/ns/nso/cfp/cisco-
etsi-nfvo">
        <id>e1000_net</id>
        <value>false</value>
      </additional-setting>
      <additional-setting xmlns="http://cisco.com/ns/nso/cfp/cisco-
etsi-nfvo">
        <id>serial_console</id>
        <value>true</value>
      </additional-setting>
      <additional-setting xmlns="http://cisco.com/ns/nso/cfp/cisco-
etsi-nfvo">
        <id>virtio_net</id>
        <value>false</value>
      </additional-setting>
    </sw-image-desc>
    <ext-cpd>
      <id>left</id>
      <int-cpd>
```

```
            <vdu-id>CSR</vdu-id>
            <cpd>left</cpd>
          </int-cpd>
          <layer-protocol>ipv4</layer-protocol>
        </ext-cpd>
        <ext-cpd>
          <id>mgmt</id>
          <int-cpd>
            <vdu-id>CSR</vdu-id>
            <cpd>mgmt</cpd>
          </int-cpd>
          <layer-protocol>ipv4</layer-protocol>
        </ext-cpd>
        <ext-cpd>
          <id>right</id>
          <int-cpd>
            <vdu-id>CSR</vdu-id>
            <cpd>right</cpd>
          </int-cpd>
          <layer-protocol>ipv4</layer-protocol>
        </ext-cpd>
        <df>
          <id>basic</id>
          <vdu-profile>
            <id>CSR</id>
            <min-number-of-instances>1</min-number-of-instances>
            <max-number-of-instances>10</max-number-of-instances>
          </vdu-profile>
          <instantiation-level>
            <id>basic</id>
            <vdu-level>
              <vdu-id>CSR</vdu-id>
              <number-of-instances>1</number-of-instances>
            </vdu-level>
          </instantiation-level>
          <instantiation-level>
            <id>gold</id>
            <vdu-level>
              <vdu-id>CSR</vdu-id>
              <number-of-instances>4</number-of-instances>
            </vdu-level>
          </instantiation-level>
          <default-instantiation-level>basic</default-instantiation-level>
          <affinity-or-anti-affinity-group>
            <id>group_affinity_node_1</id>
            <type>affinity</type>
            <scope>nfvi-node</scope>
          </affinity-or-anti-affinity-group>
          <affinity-or-anti-affinity-group>
            <id>group_anti_affinity_node_1</id>
            <type>anti-affinity</type>
            <scope>nfvi-node</scope>
          </affinity-or-anti-affinity-group>
        </df>
        <artifact xmlns="http://cisco.com/ns/nso/cfp/cisco-etsi-nfvo">
          <id>test</id>
          <destination-name>iosxe_config.txt</destination-name>
          <url>a/b/c</url>
          <checksum>
            <algorithm xmlns:nfv="urn:etsi:nfv:yang:etsi-nfv-
descriptors">nfv:sha-256</algorithm>
```

```
            <hash>3af30fce37a4c5c831e095745744d6d2</hash>
          </checksum>
          <variable>
            <id>a</id>
          </variable>
          <variable>
            <id>b</id>
          </variable>
          <variable>
            <id>c</id>
          </variable>
        </artifact>
      </vnfd>
      </nfv>
    </config>
```