CISCO.

Cisco Elastic Service Controller 5.10 Netconf API Guide

Updated: October, 2024

Contents

1   Introduction

The NETCONF API of ESC is to let the northbound clients communicate with ESC using the NETCONF protocol.

1.1   Using NETCONF API

ESC's NETCONF API can be accessed using any client that can communicate using the Netconf/Yang Protocol. The easiest way to interact with the NETCONF Interface is using the Confd. ConfD provides a python-based program called netconf-console that ships with ConfD. On any ESC VM, the netconf-console is located in:

```
/opt/cisco/esc/confd/bin/netconf-console
```
The Netconf API is hosted on port 830.

The following operations below are supported by netconf-console, the examples presume `/opt/cisco/esc/confd/bin` is in the execution path:

1.1.1   Get configuration

```
# netconf-console --user=admin --password=<confd-password>
--port=830 --get-config -x "/esc_datamodel"
```

1.1.2   Get non-configurable data

```
# netconf-console --user=admin --password=<confd-password>
--port=830 --get -x "/esc_datamodel/opdata"
```

1.1.3   Subscribe ESC notifications

```
# netconf-console --user=admin --password=<confd-password>
--port=830 --create-subscription=escEvent
```

1.1.4   Make RPC calls

```
# netconf-console --user=admin --password=<confd-password>
--rpc rpc.xml
```

1.1.5   Push in configurations

```
# netconf-console --user=admin --password==<confd-password>
--edit-config cfg.xml
```

1.2   ESC esc_nc_cli script

ESC's also provides a script which wraps the native `netconf-console` in an ESC functional specific manner, providing a simple method to perform common tasks. This should be the preferred method to interact with the NETCONF Interface and is fully supported.

On any ESC VM, the `esc_nc_cli` script is located in `/usr/bin`, therefore will be in the execution path of every operating system user.

The `esc_nc_cli` script can be run by the *admin* operating system user without the `sudo` requirement.

The following operations show a small subset of the common tasks which can be performed.

NOTE: ConfD RPC calls cannot be directly made using this script: the `netconf-console` script should be used for that purpose, as shown above.

1.2.1 Show all available commands
```
# esc_nc_cli help
```

1.2.2 Get configuration
```
# esc_nc_cli --user admin --password <confd-password> get-
config
```

1.2.3 Get non-configurable data
```
# esc_nc_cli --user admin --password <confd-password> get
```

1.2.4 Push in configurations
```
# esc_nc_cli --user admin --password <confd-password> edit-
config cfg.xml
```

1.3 SSH RSA Key-based authentication for the `esc_nc_cli` script
The examples above show esc_nc_cli script using user/password-based authentication.
Up to and including ESC 5.3, the operating system *admin* user has an SSH RSA key automatically generated under its home directory: `/home/admin/.ssh`. It is public key is stored in the ConfD database authentication data against the ConfD *admin* user and can be used in conjunction with a matching private key when validating access to the NETCONF API.
By default, if a user and password are **not** presented to the `esc_nc_cli` script as parameters, then authentication would be RSA key based, using the *admin* user's private RSA key (remember, the public key was automatically stored within the ConfD database during ESC VM creation) and the ConfD *admin* user.
Therefore, the following is valid:
```
# esc_nc_cli get-config
Get Configured data
/opt/cisco/esc/confd/bin/netconf-console --port=830 --host=127.0.0.1 -
-user=esc-nc-admin --privKeyFile=/home/admin/.ssh/confd_id_rsa --
privKeyType=rsa --get-config -x "esc_datamodel"
```
the output following the command shows the private RSA key authentication.
From ESC 5.4 onwards, the operating system *admin* user does not have an SSH key automatically generated during ESC, therefore RSA key validation is not possible "out-of-the-box".
This can be enabled via the following post ESC VM creation command run as root:
```
# escadm confd keygen --user admin
```
This will a) generate an RSA SSH key under /home/admin/.ssh and b) populate the ConfD database authentication data with the public key.
NOTE: No passphrase is required.

1.4 ConfD CLI
ConfD has a CLI to enable user to read, write configurations and check operational data.
The path of ConfD CLI in ESC is in:
```
/opt/cisco/esc/confd/bin/confd_cli
```
NOTE: From ESC 5.4 and beyond, the `confd_cli` command can only be executed by the *root* user, or a user with Linux `sudo` privileges, due to security hardening measures.

1.5 Change ConfD Admin Password
ConfD admin Password can be changed using ConfD CLI.

```
# sudo /opt/cisco/esc/confd/bin/confd_cli -u admin
admin@host> configure
admin@host% set aaa authentication users user admin
password ESCt3st!234 (ESCt3st!234 is the new password)
admin@host% commit
```

1.6 NETCONF Protocol Operations

This table captures what are the NETCONF Protocol Operations supported by ESC.

Operation	Usage	Description	Supported
close-session	:base	Terminate this session	Yes
commit	:base AND :candidate	Commit the contents of the <candidate/> configuration database to the <running/> configuration database	Yes
copy-config	:base	Copy a configuration database	No
create-subscription	:notification	Create a NETCONF notification subscription	Yes
delete-config	:base	Delete a configuration database	Yes
discard-changes	:base AND :candidate	Clear all changes from the <candidate/> configuration database and make it match the <running/> configuration database	No
edit-config	:base	Modify a configuration database	Yes
get	:base	Retrieve data from the running configuration database and/or device statistics	Yes
get-config	:base	Retrieve data from the running configuration database	Yes
kill-session	:base	Terminate another session	No
lock	:base	Lock a configuration database so only my session can write	Yes
unlock	:base	Unlock a configuration database so any session can write	Yes
validate	:base AND :validate	Validate the entire contents of a configuration database	No

1.7 NETCONF Capabilities

This table captures what are the NETCONF capabilities supported by ESC.

Name	Description	Supported
:candidate	The server supports the <candidate/> database. It will allow this special database to be locked, edited, saved, and unlocked. The server will also support the <discard-changes> and basic <commit> operations.	No
:confirmed-commit	For servers that support the **:candidate** capability, this additional capability will also be advertised if the server supports the 'confirmed commit' feature. **This special mode requires a server to send two <commit> RPC method requests instead of one, to save any changes to the <running/> database.** If the second request does not arrive within a specified time interval, the server will automatically revert the running configuration to the previous version.	No
:interleave	The server will accept <rpc> requests (besides <close-session> while notification delivery is active. The :notification capability must also be present if this capability is advertised.	No
:notification	The server supports the basic notification delivery mechanisms defined in RFC 5277, e.g., the <create-subscription> operation will be accepted by the server. Unless the :interleave capability is also supported, only the <close-session> operation must be supported by the server while notification delivery is active.	Yes
:partial-lock	The server supports the <partial-lock> and <partial-unlock> operations, defined in RFC 5717. This allows multiple independent clients to each write to a different part of the <running> configuration at the same time.	No
:rollback-on-error	The server supports the 'rollback-on-error' value for the <error-option> parameter to the <edit-config> operation. If any error occurs during the requested edit operation, then the target database (usually the running configuration) will be left affected. **This provides an 'all-or-nothing' edit mode for a single <edit-config> request.**	No
:startup	The server supports the <startup/> database. It will allow the running configuration to be copied to this special database. It can also be locked, and unlocked, but a server is not required to allow it to be edited.	No
:url	The server supports the <url> parameter value form to specify protocol operation source and target parameters. The capability URI for this feature will indicate which schemes (e.g., file, https, sftp) that the server supports within a particular URL value. The 'file' scheme allows for editable local configuration databases. The other schemes allow for remote storage of configuration databases.	No
:validate	The server supports the <validate> operation. When this operation is requested on a target database, the server will perform some amount of parameter validation and referential integrity checking. Since the standard does not define exactly what must be validated by this operation, a client cannot really rely on it for anything useful. This operation is used to validate a complete database. There is no standard way to	No

	validate a single edit request against a target database, however a non-standard set-option for the <edit-config> operation called **test-only** has been defined for this purpose.	
:writable-running	The server allows the client to change the running configuration directly. Either this capability or the **:candidate** capability will be supported by the server, but usually not both.	Yes
:xpath	The server fully supports the XPath 1.0 specification for filtered retrieval of configuration and other database contents. The 'type' attribute within the <filter> parameter for <get> and <get-config> operations may be set to 'xpath'. The 'select' attribute (which contains the XPath expression) will also be supported by the server. A server may support partial XPath retrieval filtering, but it cannot advertise the **:xpath**capability unless the entire XPath 1.0 specification is supported.	No

2 ESC Datamodel

ESC defines datamodel in Yang language. The ESC Datamodel can be found in the below location in the ESC VM

/opt/cisco/esc/esc-confd/YANGmodels-tailf

The datamodel contains three major sections

- Configuration
- Operational Data
- Notifications

The configuration section defines the configuration that a northbound user sends to ESC. ESC will accept the configuration after initial validation. Once a request is accepted, ESC will begin processing the request. Once the request is successfully processed, ESC will send a success notification and update the Operational data to reflect the current status and details.

3 Configuration Data

In the ESC Data Model, any object that can be created and deleted through Netconf is represented using the Netconf Configuration datastore. ESC contains only a single Configuration datastore, the *running* configuration datastore. Therefore, configuration changes, once accepted, are applied immediately to the *running* configuration datastore, and immediately reflect the new running configuration.

3.1 Reading Configuration Data

Configuration data can be retrieved from ESC using the Netconf *get-config* rpc method. A Netconf subtree filter or XPath filter should be supplied to limit the results that will be retrieved (see Netconf specification for more details).

3.1.1 Fetching all config data

The example below illustrates how to fetch all existing configuration data from ESC, which in this example includes a deployed Cisco Cloud Service Router (CSR). This request uses a fully inclusive XPath filter that requests all ESC configuration data.

3.1.1.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get-config>
    <source>
      <running/>
    </source>
    <filter select=" esc_datamodel " type="xpath"/>
  </get-config>
</rpc>
```

3.1.1.2 Netconf Response

```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <tenants>
        <tenant>
          <name>admin</name>
        </tenant>
        <tenant>
          <name>vnf-tenant</name>
          <deployments>
            <deployment>
              <name>csr-dep</name>
              <networks>
```

```xml
<network>
  <name>csr-net</name>
  <shared>false</shared>
  <admin_state>true</admin_state>
  <subnet>
    <name>csr-subnet</name>
    <ipversion>ipv4</ipversion>
    <dhcp>true</dhcp>
    <address>10.91.90.0</address>
    <netmask>255.255.255.0</netmask>
    <gateway>10.91.90.1</gateway>
  </subnet>
</network>
</networks>
<vm_group>
  <name>csr-dep</name>
  <bootup_time>600</bootup_time>
  <recovery_wait_time>0</recovery_wait_time>
  <interfaces>
    <interface>
      <nicid>0</nicid>
      <network>esc-net</network>
    </interface>
    <interface>
      <nicid>1</nicid>
      <network>csr-net</network>
    </interface>
  </interfaces>
  <kpi_data>
    <kpi>
      <event_name>VM_ALIVE</event_name>
      <metric_value>1</metric_value>
      <metric_cond>GT</metric_cond>
      <metric_type>UINT32</metric_type>
      <metric_collector>
        <type>ICMPPing</type>
        <nicid>0</nicid>
        <poll_frequency>3</poll_frequency>
        <polling_unit>seconds</polling_unit>
        <continuous_alarm>false</continuous_alarm>
      </metric_collector>
    </kpi>
    <kpi>
      <event_name>VM_OVERLOADED</event_name>
      <metric_value>1</metric_value>
      <metric_cond>GE</metric_cond>
      <metric_type>UINT32</metric_type>
      <metric_collector>
        <type>Memory</type>
        <nicid>0</nicid>
        <poll_frequency>3</poll_frequency>
        <polling_unit>seconds</polling_unit>
        <continuous_alarm>false</continuous_alarm>
      </metric_collector>
    </kpi>
    <kpi>
      <event_name>VM_UNDERLOADED</event_name>
      <metric_value>99</metric_value>
      <metric_cond>LE</metric_cond>
      <metric_type>UINT32</metric_type>
      <metric_collector>
        <type>CPU</type>
        <nicid>0</nicid>
        <poll_frequency>3</poll_frequency>
        <polling_unit>seconds</polling_unit>
        <continuous_alarm>false</continuous_alarm>
      </metric_collector>
    </kpi>
  </kpi_data>
  <rules>
    <admin_rules>
      <rule>
```

```xml
          <event_name>VM_ALIVE</event_name>
          <action>ALWAYS log</action>
          <action>FALSE recover autohealing</action>
          <action>TRUE servicebooted.sh</action>
        </rule>
        <rule>
          <event_name>VM_OVERLOADED</event_name>
          <action>ALWAYS log</action>
        </rule>
        <rule>
          <event_name>VM_UNDERLOADED</event_name>
          <action>ALWAYS log</action>
        </rule>
      </admin_rules>
    </rules>
    <config_data>
      <configuration>
        <dst>iosxe_config.txt</dst>
        <file>file://cisco/images/csr_config.sh</file>
      </configuration>
    </config_data>
    <scaling>
      <min_active>1</min_active>
      <max_active>5</max_active>
      <elastic>true</elastic>
    </scaling>
      </vm_group>
        </deployment>
      </deployments>
    </tenant>
    </tenants>
  </esc_datamodel>
  </data>
</rpc-reply>
```

3.1.2 Example: Fetching deployed services by network name

The example below illustrates how to fetch all deployed services that contain an interface bound to the given network 'esc-net', using an XPath filter. Note that in the response, only elements representing key data are shown in the ancestor elements.

3.1.2.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get-config>
    <source>
      <running/>
    </source>
    <filter type="xpath"
select="esc_datamodel/tenants/tenant/deployments/deployment/vm_group/
interfaces/interface[network='esc-net']" />
  </get-config>
</rpc>
```

3.1.2.2 Netconf Response

```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <tenants>
        <tenant>
          <name>vnf-tenant</name>
          <deployments>
            <deployment>
              <name>csr-dep</name>
              <vm_group>
                <name>csr-dep</name>
                <interfaces>
                  <interface>
                    <nicid>0</nicid>
                    <network>esc-net</network>
                  </interface>
                </interfaces>
              </vm_group>
            </deployment>
          </deployments>
        </tenant>
      </tenants>
    </esc_datamodel>
  </data>
</rpc-reply>
```

3.2 Writing Configuration Data (CRUD operations)

Create, Update, or Delete operations are performed on configuration data through the standard Netconf *edit-config* request. By default, only nodes that are explicitly specified in the *edit-config* request will be changed (see Netconf specification for more details).

Most configuration changes in ESC follow a two-stage model. The first stage begins when the Netconf request is received and ends when the response is returned to the Netconf client. If the request is validated and the configuration accepted during the first stage, then the configuration workflow transitions to the second stage, which occurs asynchronously inside ESC. The second stage involves processing the workflow and activating the change in ESC and in the VIM. These two stages are described in more detail below.

3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request

A Netconf *rpc-reply* response is returned to indicate the status of the configuration request. This response will indicate whether the configuration request was accepted or rejected by ESC.

The *rpc-reply* response will contain a status body:

- A Netconf *ok* status inside the *rpc-reply* means that the configuration request was validated and accepted by ESC. E.g.:

```
<rpc-reply message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <ok/>
</rpc-reply>
```

  An *ok* status indicates that the data model has been updated with the new configuration, and the workflow for activating the configuration has been submitted for asynchronous processing.

- A Netconf *rpc-error* status inside the *rpc-reply* means that the configuration request failed validation and was rejected by ESC. E.g.:

```
<rpc-reply message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <rpc-error>
    <error-type>application</error-type>
    <error-tag>invalid-value</error-tag>
    <error-severity>error</error-severity>
    <error-path xmlns:esc="http://www.cisco.com/esc/esc">/rpc/edit-
config/config/esc:esc_datamodel/esc:tenants/esc:tenant/esc:name
    </error-path>
    <error-message xml:lang="en">"" is not a valid value.</error-message>
    <error-info>
      <bad-element>name</bad-element>
    </error-info>
  </rpc-error>
</rpc-reply>
```

  An *rpc-error* status indicates that the configuration in ESC remains unchanged and there is no further cleanup required in ESC or in the VIM to back-out the change. As shown above, the *rpc-error* body contains information about the error that occurred.

3.2.2 Stage 2: Activation of a new Configuration

When a configuration is accepted by ESC, the workflows for activating the configuration are submitted for asynchronous processing. These workflows may update internal states within ESC, and create, update, or delete resources in the VIM. The ESC Netconf API provides two mechanisms for communicating the outcome of a configuration activation. These two mechanisms are Event Notifications and Operational Data and are discussed below.

3.2.2.1 Event Notifications

ESC will generate *escEvent* Notifications for events that occur during the activation of a new configuration. A Netconf client can subscribe for these notifications in order to monitor the progress of

the activation. This is the recommended way of monitoring the status of an activation. Each **escEvent** notification will have a status of **SUCCESS** or **FAILURE**, to report progress during various stages of activation.

3.2.2.2   Operational Data

ESC provides operational data (also called **state data** in Netconf) through the Netconf interface, which reflects the current operational state of ESC and the VIM resources that are being managed by ESC. During various stages of activation, the operational data may be updated to reflect the new state. Operational data will be updated after a configuration is successfully activated. Refer to section 6.1 for details on the impact of specific configuration changes on operational data. Refer to section 4.1 for general information on reading operational data through the Netconf interface.

3.2.2.3   Activation Failures

If a failure occurs while activating the configuration change, the operational data may be left in a state that is inconsistent with the configuration. Therefore, when a failure occurs it may be necessary for the Netconf client to revert the ESC configuration, or for an operator to clean up the VIM configuration, in order to bring ESC and the VIM back to a consistent operational state. Refer to section 6.1 for instructions on handling activation failures for specific workflows.

3.2.3   Configuration Workflows

ESC uses configuration workflows to manage configuration changes. The supported workflows are defined in detail in section 6.1. In general, a separate Netconf **edit-config** request should be sent for each specific configuration workflow. So, for example, one service deployment would map to a single workflow, and therefore a single Netconf **edit-config** request.
There are some workflows however that can be combined into a single Netconf **edit-config** request. See the next section for more details on combining workflows.

3.2.4   Combining Workflows

ESC supports combining some workflows into a single Netconf **edit-config** request.
As of ESC 1.0, any number of the following workflow types can be combined into a single Netconf request:

- o   Tenant Creation
- o   Tenant Deletion
- o   Service Registration
- o   Service De-registration

Any other workflows must each be sent in a separate Netconf **edit-config** request. Combining workflows other than those specified above will result in an **rpc-error** response and a configuration rejection

4 Operational Data

4.1 Reading Operational Data

Operational data can be retrieved from ESC using the Netconf **get** rpc method. A Netconf subtree filter or XPath filter should be supplied to limit the results that will be retrieved (see Netconf specification for more details).

4.1.1 Fetching all operational data

In this example, we will fetch all operational data from ESC, which includes a deployed Cisco Cloud Service Router (CSR). This request uses a fully inclusive XPath filter that requests all ESC operational data. Note that specifying "**esc_datamodel/opdata**" in the filter will ensure that no configuration data will be returned.

4.1.1.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <filter select="esc_datamodel/opdata" type="xpath"/>
  </get>
</rpc>
```

4.1.1.2 Netconf Response

```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <opdata>
        <status>OPER_UP</status>
        <stats>
          <hostname>esc-vm</hostname>
          <os_name>Linux</os_name>
          <os_release>2.6.32-504.16.2.el6.x86_64</os_release>
          <arch>amd64</arch>
          <uptime>98960</uptime>
          <cpu>
            <cpu_num>4</cpu_num>
          </cpu>
        </stats>
        <tenants>
          <tenant>
            <name>admin</name>
            <tenant_id>6b81858d5de047e8b650589bdcbcf32e</tenant_id>
          </tenant>
          <tenant>
            <name>vnf-tenant</name>
            <tenant_id>dccd22a13cc64e388a4b8d39e6a8fa7f</tenant_id>
            <networks>
              <network>
                <name>csr-net</name>
                <netid>a39af676-5004-4f2d-8b7b-d4c804645dc3</netid>
                <shared>false</shared>
                <status>active</status>
                <subnets>
                  <subnet>
                    <name>csr-subnet</name>
                    <subnetid>de4625ad-5465-4812-ab9c-
de4a0ed21063</subnetid>
                    <cidr>10.91.90.0/24</cidr>
                    <gateway>10.91.90.1</gateway>
                    <dhcp>true</dhcp>
                    <ipversion>4</ipversion>
                  </subnet>
                </subnets>
              </network>
```

```xml
          </networks>
          <deployments>
            <deployment_name>csr-dep</deployment_name>
            <service_name>-</service_name>
            <service_version>-</service_version>
            <deployment_id>vnf-tenantcsr-depcsr-reg1.2</deployment_id>
            <vm_group>
              <name>csr-vm</name>
              <vm_instance>
                <vm_id>b25a8634-ee2f-46b5-94d1-d2cf20ed93ea</vm_id>
                <name>csr-reg_64600_vnf-tenant_vnf-tenantcsr-depcsr-reg1.2_0_csr-vm_0</name>
                <host_id>d43732ea7ac2a3ead6f400e8f887dc706605b5729c39e553f6af6031</host_id>
                <hostname>compute-host-1</hostname>
                <interfaces>
                  <interface>
                    <nicid>0</nicid>
                    <port_id>66ba846f-c02a-4c2b-964b-4572d938b5e4</port_id>
                    <network>7af5c7df-6246-4d53-91bd-aa12a1607656</network>
                    <subnet>7cb6815e-3023-4420-87d8-2b10efcbe14e</subnet>
                    <ip_address>192.168.0.58</ip_address>
                    <mac_address>fa:16:3e:c0:fd:49</mac_address>
                  </interface>
                  <interface>
                    <nicid>1</nicid>
                    <port_id>f6a1d46d-d5ad-4b7e-a48a-3d539a920994</port_id>
                    <network>a39af676-5004-4f2d-8b7b-d4c804645dc3</network>
                    <subnet>de4625ad-5465-4812-ab9c-de4a0ed21063</subnet>
                    <ip_address>10.91.90.2</ip_address>
                    <mac_address>fa:16:3e:64:8c:a6</mac_address>
                  </interface>
                </interfaces>
              </vm_instance>
            </vm_group>
            <state_machine>
              <state>SERVICE_ACTIVE_STATE</state>
              <vm_state_machines>
                <vm_state_machine>
                  <vm_name> csr-reg_64600_vnf-tenant_vnf-tenantcsr-depcsr-reg1.2_0_csr-vm_0</vm_name>
                  <state>VM_ALIVE_STATE</state>
                </vm_state_machine>
              </vm_state_machines>
            </state_machine>
          </deployments>
        </tenant>
      </tenants>
    </esc_datamodel>
  </data>
</rpc-reply>
```

5 Custom RPC Methods

The ESC Netconf interface provides some custom RPC methods for controlling operational states of deployed services and VMs.

5.1 serviceAction method

This method is used to perform service actions including stop, start, reboot, disable-monitor and enable monitor.

Refer to section 0 for ESC workflows using the serviceAction method.

5.2 vmAction method

This method is used to perform VM actions including stop, start, reboot, disable-monitor and enable monitor.

Refer to section 6.2.2 for ESC workflows using the vmAction method.

6 ESC Workflows using Netconf

6.1 Configuration Workflows

6.1.1 Create Vim Connector

In ESC 2.3 or later, a new Vim Connector datamodel is defined to add, update, or delete the Vim Connectors. Before ESC 2.3, Vim credentials have to be added during installation. Now, ESC can be installed without Vim Credential. The Vim Credential can be configured at a later time using the Vim Connector. From 3.0, ESC supports adding multiple Vim Connectors. If no Vim Connector has been added or configured during installation, ESC will reject the northbound config requests that require Vim Credentials. As part of update, user name and password can be updated.

6.1.1.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <source>
      <running/>
    </source>
    <config>
      <esc_system_config xmlns="http://www.cisco.com/esc/esc">
        <vim_connectors>
          <!--represents a vim-->
          <vim_connector>
            <!--unique id for each vim-->
            <id>openstack-vim</id>
            <!--vim type [OPENSTACK|VMWARE_VSPHERE|...]-->
            <type>OPENSTACK</type>
            <properties>
              <!-- The os_auth_url is mandatory property for Openstack-->
              <property>
                <name>os_auth_url</name>
                <value>http://{os_ip:port}/v3</value>

              </property>
              <!-- The project name is mandatory property for Openstack-->
              <property>
                <name>os_project_name</name>
                <value>vimProject</value>
              </property>
              <!-- The project domain name is mandatory if using Openstack
v3 identity api -->
              <property>
                <name>os_project_domain_name</name>
                <value>default</value>
              </property>
              <!-- The openstack identity api version-->
              <property>
                <name>os_identity_api_version</name>
                <value>3</value>
              </property>
            </properties>
          </vim_connector>
        </vim_connectors>
      </esc_system_config>
    </config>
  </edit-config>
</rpc>
```

6.1.1.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.1.3 Configuration Activation

On Success:

Event notification
An escEvent of type **CREATE_VIM_CONNECTOR** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in ESC.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-07-21T08:24:34.08+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Created vim connector successfully.</status_message>
    <vim_connector_id>openstack-vim</vim_connector_id>
    <event>
      <type>CREATE_VIM_CONNECTOR</type>
    </event>
  </escEvent>
</notification>
```

Operational data
After a Vim Connector creation configuration has been successfully activated, the operational data for the vim connector will show the Vim Connector id and the status of the VIM. A **CONNECTION_FAILED** status mean ESC is unable to establish Vim Connection, **NO_CREDENTIALS** status if Vim Connector has been added but no Vim User has been added. A **CONNECTION_SUCCESSFUL** means the Vim is reachable and Vim User is successfully authenticated.

Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <filter
select="esc_datamodel/opdata/system_config/vim_connectors/vim_connector[id=openstack-
vim]" type="xpath"/>
  </get>
</rpc>
```

Netconf Response
```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <opdata>
        <system_config>
          <vim_connectors>
            <vim_connector>
              <id>openstack-vim</id>
              <status>CONNECTION_SUCCESSFUL</status>
              <status_message>Successfully connected to
VIM</status_message>
            </vim_connector>
          </vim_connectors>
        </system_config>
      </opdata>
    </esc_datamodel>
  </data>
</rpc-reply>
```

On Failure:

Event notification
An escEvent of type **CREATE_VIM_CONNECTOR** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be completed for some reason.

Operational data
After a Vim Connector creation configuration has failed activation, there will be no change to the operational data.

Handling Activation Failures
If a **failure** occurs while activating a Create Vim Connector configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Vim Connector configuration change. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.2   Delete Vim Connector
The Vim Connector can be deleted if there are no resources/deployments in ESC referring to the Vim Connector. But for the default Vim Connector, once it is successfully authenticated, cannot be deleted. If a Vim User exists for the Vim Connector, it has to be deleted before deleting the Vim Connector.

6.1.2.1 Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <esc_system_config xmlns="http://www.cisco.com/esc/esc">
        <vim_connectors>
          <vim_connector nc:operation="delete">
            <id>openstack-vim</id>
          </vim_connector>
        </vim_connectors>
      </esc_system_config>
    </config>
  </edit-config>
</rpc>
```

6.1.2.2 Netconf Response
An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.2.3 Configuration Activation

On Success:

Event notification
An escEvent of type **DELETE_VIM_CONNECTOR** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully deleted from ESC.
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-07-21T09:02:00.692+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Deleted vim connector successfully.</status_message>
    <vim_connector_id>openstack-vim</vim_connector_id>
    <event>
      <type>DELETE_VIM_CONNECTOR</type>
    </event>
  </escEvent>
</notification>
```

Operational data
After a Vim Connector deletion configuration has been successfully activated, there will be no operational data for the Vim Connector.

On Failure:

Event notification
An escEvent of type **DELETE_VIM_CONNECTOR** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason.

6.1.3 Update Vim Connector

Update Vim Connector allows the Vim Connector properties to be updated. This is allowed only if there are no resources/deployments in ESC referring the Vim Connector.

6.1.3.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <source>
      <running/>
    </source>
    <config>
      <esc_system_config xmlns="http://www.cisco.com/esc/esc">
        <vim_connectors>
          <!--represents a vim-->
          <vim_connector nc:operation='replace'>
            <id>openstack-vim</id>
            <type>OPENSTACK</type>
            <properties>>
              <property>
                <name>os_auth_url</name>
                <value>http://{os_ip:port}/v3</value>
              </property>
              <property>
                <name>os_project_name</name>
                <value>vimProject</value>
              </property>
              <property>
                <name>os_project_domain_name</name>
                <value>default</value>
              </property>
              <property>
                <name>os_identity_api_version</name>
                <value>3</value>
              </property>
            </properties>
          </vim_connector>
        </vim_connectors>
      </esc_system_config>
    </config>
  </edit-config>
</rpc>
```

6.1.3.2 Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.3.3 Configuration Activation

On Success:

Event notification

An escEvent of type **UPDATE_VIM_CONNECTOR** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully updated in ESC.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-07-21T12:03:09.088+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Updated vim connector successfully.</status_message>
    <vim_connector_id>openstack-vim</vim_connector_id>
    <event>
```

```
        <type>UPDATE_VIM_CONNECTOR</type>
      </event>
    </escEvent>
  </notification>
```

On Failure:

Event notification

An escEvent of type **UPDATE_VIM_CONNECTOR** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be completed for some reason.

6.1.4 Create Vim User

In ESC 3.0, adding only one Vim User per Vim Connector is supported. Request to add more than one user will be rejected.

6.1.4.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <source>
      <running/>
    </source>
    <config>
      <esc_system_config xmlns="http://www.cisco.com/esc/esc">
        <vim_connectors>
          <vim_connector>
            <id>openstack-vim</id>
            <users>
              <user>
                <id>vimUserName</id>
                <credentials>
                  <properties>
                    <property>
                      <name>os_password</name>
                      <value>userPassword</value>
                    </property>
                    <!-- The user domain name is mandatory if using
Openstack v3 identity api -->
                    <property>
                      <name>os_user_domain_name</name>
                      <value>default</value>
                    </property>
                  </properties>
                </credentials>
              </user>
            </users>
          </vim_connector>
        </vim_connectors>
      </esc_system_config>
    </config>
  </edit-config>
</rpc>
```

Note – Create Vim User does not create a user in the Vim, it will add the Vim User credentials in ESC to be able to authenticate to the Vim.

6.1.4.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request** for more details.

6.1.4.3 Configuration Activation

On Success:

Event notification

An escEvent of type **CREATE_VIM_USER** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in ESC.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-07-21T08:24:34.306+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Created vim user successfully.</status_message>
```

```
                    <vim_connector_id>openstack-vim</vim_connector_id>
                    <vim_user_id>vimUserName</vim_user_id>
                    <event>
                      <type>CREATE_VIM_USER</type>
                    </event>
                </escEvent></notification>
```

Operational data

After a Vim User creation configuration has been successfully activated, if the Vim is reachable, the operational data for the Vim Connector will show the status of the Vim as either **CONNECTION_SUCCESSFUL** for successful authentication or **AUTHENTICATION_FAILED** for failed authentication.

Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <filter
select="esc_datamodel/opdata/system_config/vim_connectors/vim_connector[id='openstack-
vim']" type="xpath"/>
  </get>
</rpc>
```

Netconf Response
```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <opdata>
        <system_config>
          <vim_connectors>
            <vim_connector>
              <id>openstack-vim</id>
              <status>CONNECTION_SUCCESSFUL</status>
              <status_message>Successfully connected to
VIM</status_message>
            </vim_connector>
          </vim_connectors>
        </system_config>
      </opdata>
    </esc_datamodel>
  </data>
</rpc-reply>
```

On Failure:

Event notification

An escEvent of type **CREATE_VIM_USER** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason.

Operational data

After a Vim User creation configuration has failed activation, there will be no change to the operational data.

Handling Activation Failures

If a **failure** occurs while activating a Create Vim User configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Vim User configuration change. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.5   Delete Vim User

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <esc_system_config xmlns="http://www.cisco.com/esc/esc">
          <vim_connectors>
            <vim_connector>
              <id>openstack-vim</id>
              <users>
                <user nc:operation='delete'>
                  <id>vimUserName</id>
                </user>
              </users>
            </vim_connector>
          </vim_connectors></esc_system_config>
    </config>
  </edit-config>
</rpc>
```

Note – Delete Vim User does not delete the User from the Vim, it will delete the Vim User credentials from ESC, and it can no longer be used to authenticate to the Vim.

6.1.5.2 Netconf Response

An ***rpc-reply*** response is returned with a status of ***ok*** if the request was accepted for activation, or a status of ***rpc-error*** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details

6.1.5.3 Configuration Activation

On Success:

Event notification

An escEvent of type ***DELETE_VIM_USER*** with a status of ***SUCCESS*** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully deleted from ESC.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-06T16:33:27.197+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Deleted vim user successfully.</status_message>
    <vim_connector_id>openstack-vim</vim_connector_id>
    <vim_user_id>vimuserName</vim_user_id>
    <event>
      <type>DELETE_VIM_USER</type>
    </event>
  </escEvent>
</notification>
```

Operational data

After a Vim User deletion configuration has been successfully activated, the vim connector status will show ***NO_CREDENTIALS*** if the Vim is still reachable.

On Failure:

Event notification
An escEvent of type **DELETE_VIM_USER** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason.

6.1.6   Update Vim User

Update Vim User allows the Vim User credential properties to be updated.

6.1.6.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <source>
      <running/>
    </source>
    <config>
      <esc_system_config xmlns="http://www.cisco.com/esc/esc">
        <vim_connectors>
          <vim_connector>
          <id>openstack-vim</id>
            <users>
              <user nc:operation='replace'>
                <id>vimUserName</id>
                <credentials>
                  <properties>
                    <property>
                      <name>os_password</name>
                      <value>newPassword</value>
                    </property>
                    <property>
                      <name>os_user_domain_name</name>
                      <value>default</value>
                    </property>
                  </properties>
                </credentials>
              </user>
            </users>
          </vim_connector>
        </vim_connectors>
      </esc_system_config>
    </config>
  </edit-config>
</rpc>
```

6.1.6.2   Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.6.3 Configuration Activation

On Success:

Event notification

An escEvent of type **UPDATE_VIM_CONNECTOR** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully updated in ESC.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-07-21T12:12:01.212+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Updated vim user successfully.</status_message>
    <vim_connector_id>openstack-vim</vim_connector_id>
    <vim_user_id>vimUserName</vim_user_id>
    <event>
      <type>UPDATE_VIM_USER</type>
    </event>
  </escEvent>
```

```
        </notification>
```

On Failure:

Event notification
An escEvent of type **UPDATE_VIM_USER** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be completed for some reason.

6.1.7 Create Default Vim Connector

In ESC 3.0, if Vim Credentials have not been passed during installation, the default Vim Connector will not be created. After adding Vim Connector/s using the Vim Connector APIs, one of the Vim Connectors can be configured as the default Vim Connector using this Default Vim Connector API. If no Vim Connector Id specified in a config request for resource/deployments, then the resource/deployment will be configured on the Default Vim.

6.1.7.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
   <edit-config>
      <source>
         <running/>
      </source>
      <config>
         <esc_system_config xmlns="http://www.cisco.com/esc/esc">
            <vim_connectors>
               <default_vim_connector>openstack-vim</default_vim_connector>
            </vim_connectors>
         </esc_system_config>
      </config>
   </edit-config>
</rpc>
```

6.1.7.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.7.3 Configuration Activation

On Success:

Event notification

An escEvent of type **CREATE_DEFAULT_VIM_CONNECTOR** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in ESC.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2017-07-21T11:32:58.938+00:00</eventTime>
   <escEvent xmlns="http://www.cisco.com/esc/esc">
      <status>SUCCESS</status>
      <status_code>200</status_code>
      <status_message>Created default vim connector
successfully.</status_message>
      <event>
         <type>CREATE_DEFAULT_VIM_CONNECTOR</type>
      </event>
   </escEvent>
</notification>
```

Operational data

After a Default Vim Connector creation configuration has been successfully activated, the operational data will add configurations of the Default Vim to the **{vim_type}_config** section under the **system_config**.

Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
```

```
<get>
  <filter select="esc_datamodel/opdata/system_config" type="xpath"/>
</get>
</rpc>
```

Netconf Response
```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <opdata>
        <system_config>
          <active_vim>OPENSTACK</active_vim>
          <openstack_config>
            <os_auth_url>https://xxx:xxx/v3</os_auth_url>
            <admin_role>admin</admin_role>
            <os_tenant_name>vimProject</os_tenant_name>
            <os_username>vimUserName</os_username>
            <member_role>_member_</member_role>
          </openstack_config>
          <vim_connectors>
            <vim_connector>
              <id>openstack-vim</id>
              <status>CONNECTION_SUCCESSFUL</status>
              <status_message>Successfully connected to
VIM</status_message>
            </vim_connector>
          </system_config>
        </opdata>
      </esc_datamodel>
    </data>
</rpc-reply>
```

On Failure:

Event notification
An escEvent of type **CREATE_DEFAULT_VIM_CONNECTOR** with a status of **FAILURE** will be sent to
Netconf subscribers if the configuration action cannot be completed for some reason.

Operational data
After a Default Vim Connector creation configuration has failed activation, there will be no change to
the operational data.

6.1.8   Delete Default Vim Connector
In ESC 3.0, the default Vim Connector once created cannot be deleted.

6.1.9 Create Tenant

Three types of tenants can be created in ESC:

- Tenant on the VIM (ESC creates the tenant)— ESC creates and uses the tenant for deployments on default VIM. ESC can delete this tenant.

```
<tenants>
    <tenant>
        <name>new-tenant</name>
        <managed_resource>true</managed_resource>
    </tenant>
</tenants>
```

- Pre-existing (out-of-band) tenant on the VIM— ESC does not create this tenant but uses the tenant for deployments on default VIM only. The admin tenant, for example, is a pre-existing tenant, where the ESC itself is deployed. ESC supports deploying resources such as flavors, images and volumes on a pre-existing tenant that is identified by its name or UUID. ESC manages a pre-existing tenant for default VIM only. ESC cannot delete a pre-existing tenant.

```
<tenants>
    <tenant>
        <name>pre-existing</name>
        <managed_resource>false</managed_resource>
    </tenant>
</tenants>
```

- Tenant within ESC— ESC creates a tenant within ESC, which is independent of any VIM. This tenant acts as the root tenant for deploying VMs on multiple VIMs.

```
<tenants>
    <tenant>
        <name>esc-tenant-A</name>
        <vim_mapping>false</vim_mapping>
    </tenant>
</tenants>
```

6.1.9.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
    <edit-config>
        <source>
            <running/>
        </source>
        <config>
            <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
                <tenants>
                    <tenant>
                        <name>mytenant</name>
                    </tenant>
                </tenants>
            </esc_datamodel>
        </config>
    </edit-config>
</rpc>
```

Note – Tenant Operations(Create and Delete) are not supported for VMware VIM !

6.1.9.2 Create Tenant with Quota Settings

ESC gives the ability to set the openstack quota settings during the tenant creation, for the first type of tenants.

This is done by adding an extension to the tenant in the netconf request.

Below an example for setting the number of cores and ports quota settings :

```
<rpc message-id="1"
xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
   <edit-config>
      <source>
         <running/>
      </source>
      <config>
         <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
            <tenants>
               <tenant>
                  <name>mytenant</name>
                  <extensions>
                     <extension>
                        <name>quota</name>
                        <properties>
                           <property>
                              <name>cores</name>
                              <value>20</value>
                           </property>
                           <property>
                              <name>ram</name>
                              <value>100</value>
                           </property>
                        </properties>
                     </extension>
                  </extensions>
               </tenant>
            </tenants>
         </esc_datamodel>
      </config>
   </edit-config>
</rpc>
```

Most of the quota settings, be it for nova or neutron, are supported. This table contains a list of all supported quota settings :

Compute quotas (Nova)	Network quotas (Neutron)
metadata_items	floatingip
floating_ips	security_group_rule
cores	security_group
injected_file_path_bytes	network
injected_files	subnet
injected_file_content_bytes	port
instances	router
key_pairs	
ram	
security_groups	
security_group_rules	

Quotas settings conditions

The names of quota settings should be entered exactly, to the letter, as specified in the previous table. Failing to do so will cause the rejection of the request by confd.

The values of the settings are integers that are superior or equal to -1 and MAX_INT. Any other value will result in the failure to create the tenant.

6.1.9.3 Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.9.4 Configuration Activation

On Success:

Event notification

An escEvent of type **CREATE_TENANT** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```xml
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-05T19:38:27.71+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Tenant successfully created</status_message>
    <tenant>mytenant</tenant>
    <vm_source/>
    <vm_target/>
    <event>
      <type>CREATE_TENANT</type>
    </event>
  </escEvent>
</notification>
```

Operational data

After a tenant creation configuration has been successfully activated, the operational data for the tenant will show the name and the tenant_id:

Netconf Request
```xml
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <filter select="esc_datamodel/opdata/tenants/tenant[name='mytenant']"
type="xpath"/>
  </get>
</rpc>
```

Netconf Response
```xml
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <opdata>
        <tenants>
          <tenant>
            <name>mytenant</name>
            <tenant_id>dccd22a13cc64e388a4b8d39e6a8fa7f</tenant_id>
```

```
            </tenant>
          </tenants>
        </esc_datamodel>
      </data>
    </rpc-reply>
```

On Failure:

Event notification

An escEvent of type **CREATE_TENANT** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. If a **FAILURE** event occurs, there may be cleanup required as described below under *Handling Activation Failures*

Operational data

After a tenant creation configuration has failed activation, there will be no change to the operational data.

Handling Activation Failures

If a **failure** occurs while activating a Create Tenant configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Tenant configuration change. A Delete Tenant sent at this stage should return an **<ok>** status but will not generate a Notification. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.10 Delete Tenant

6.1.10.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <tenants>
          <tenant nc:operation="delete">
            <name>mytenant</name>
          </tenant>
        </tenants>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.10.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.10.3 Configuration Activation

On Success:

Event notification

An escEvent of type **DELETE_TENANT** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-06T16:33:27.197+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Tenant successfully deleted</status_message>
    <tenant>mytenant</tenant>
    <vm_source>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>DELETE_TENANT</type>
    </event>
  </escEvent>
</notification>
```

Operational data

After a tenant deletion configuration has been successfully activated, there will be no operational data for the tenant.

On Failure:

An escEvent of type **DELETE_TENANT** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the configuration resource already exists in the VIM but was not created by ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Operational data
After a tenant deletion configuration has failed activation, there still will be no operational data because by default whenever a delete configuration fails then ESC cleans up the resources from its database.

Handling Activation Failures
If a **failure** occurs while activating a delete tenant configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.11 Update Tenant
The update tenant operation is supported mainly to allow the user to add, update or delete the tenant quotas for an already existing managed tenant (tenant on the vim).

Update Tenant Quotas Conditions
The same conditions that apply during the creation of the tenant with quotas also apply during the update; meaning that the quotas should be supported and part of the list mentioned in paragraph 6.1.9.2, and their values should be between -1 and MAX_INT i.e. 2,147,483,647.

6.1.11.1 Netconf request

Update tenant quotas allows the operations of add, update, and delete to be sent in the same request. To delete a tenant quota, the attribute *nc:operation="delete"* should be added to the property tag of the quota intended for deletion. Although this quota configuration will be deleted from NetConf, its value will not be changed in the VIM i.e., Openstack.
If we consider the tenant created in paragraph 6.1.9.2, this example will delete the *CORES* quotas, update the *RAM* quota, and add the INSTANCES quota.

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <source>
      <running/>
    </source>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <tenants>
          <tenant>
            <name>mytenant</name>
            <extensions>
              <extension>
                <name>quota</name>
                <properties>
                  <property nc:operation="delete">
                    <name>cores</name>
                    <value>20</value>
                  </property>
                  <property>
                    <name>ram</name>
                    <value>2147483647</value>
                  </property>
                  <property>
                    <name>instances</name>
                    <value>-1</value>
                  </property>
                </properties>
              </extension>
            </extensions>
          </tenant>
        </tenants>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.11.2 NetConf response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.11.3 Configuration Activation

On Success:

Event notification
An escEvent of type **UPDATE_TENANT** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the quota configuration has been successfully updating in the VIM.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-06T16:33:27.197+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Tenant successfully updated</status_message>
    <tenant>mytenant</tenant>
```

```
        <vm_source>
        </vm_source>
          <vm_target>
        </vm_target>
          <event>
            <type>UPDATE_TENANT</type>
          </event>
        </escEvent>
      </notification>
```

Operational data

After a tenant update configuration has been successfully activated, there will be no operational data for the tenant, because we only update the tenant quotas which are not part of the operational data.

On Failure:

Event notification

An escEvent of type **UPDATE_TENANT** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if updating a tenant that was directly deleted in the VIM but not in ESC.

Operational data

After a tenant update configuration has failed activation, there will still be no change to the operational data.

Handling Activation Failures

If a **failure** occurs while activating an update tenant configuration change, the tenant will revert back to the active state and ready to receive other operations.

6.1.12 Create Network

6.1.12.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0"><edit-config
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
 <target>
 <running/>
 </target>
 <config>
 <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
 <networks>
 <network>
 <name>mgmt-net</name>
 <shared>false</shared>
 </network>
 </networks>
 </esc_datamodel>
 </config>
 </edit-config>
</rpc>
```

Note: ESC does not allow the users to modify other properties of a network except shared property. If user tries to modify other properties of a network through service update request, ESC does not throw any error, instead ESC ignores the changes. ESC allows the users to set the shared property of a network to True only when the network is configured outside the deployment tag. If the user tries to create a network inside the ESC deployment tag with shared property as True, then ESC throws an error. Only an admin privileged tenant can update a network with the shared property as True or False. If a

non-admin tenant tries to create or update the shared property of the network, ESC throws an error.

6.1.12.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.12.3 Configuration Activation

On Success:

Note: attributes 'vlan_id', 'switch_name' and 'number_of_ports' are required for VMware VIM

Event notification
An escEvent of type **CREATE_NETWORK** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM. The network will be created as a shared network.

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T18:32:13.383+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Network creation completed successfully</status_message>
    <network>SystemAdminTenantIdmgmt-net</network>
    <tenant>SystemAdminTenantId</tenant>
    <vm_source>
  </vm_source>
    <vm_target>
  </vm_target>
    <event>
        <type>CREATE_NETWORK</type>
    </event>
  </escEvent>
</notification>
```

On Failure:

Event notification
An escEvent of type **CREATE_NETWORK** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures
If a **failure** occurs while activating a Create Network configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Network configuration change. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.13 Delete Network

6.1.13.1 Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <networks>
          <network nc:operation="delete">
            <name>mgmt-net</name>
          </network>
        </networks>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.13.2 Netconf Response
An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.13.3 Configuration Activation

On Success:

Event notification

An escEvent of type **DELETE_NETWORK** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.
```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T20:05:45.824+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>OpenStack Driver: Network successfully deleted</status_message>
    <network>SystemAdminTenantIdmgmt-net</network>
    <tenant>SystemAdminTenantId</tenant>
    <vm_source>
  </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>DELETE_NETWORK</type>
    </event>
  </escEvent>
</notification>
```

On Failure:

Event notification

An escEvent of type **DELETE_NETWORK** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the configuration resource were already deleted in the VIM and was not done from ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures

If a **failure** occurs while activating a delete network configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.14 Create Subnet

6.1.14.1 Netconf Request

For Netconf Request for adding dns servers under the subnet:

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
 <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
 <target>
<running/>
 </target>
 <config
<esc_datamodel xmlns="http://www.cisco.com/esc/esc"
xmlns:ns0="http://www.cisco.com/esc/esc"
xmlns:ns3="http://www.cisco.com/esc/esc_notifications"
xmlns:ns1="urn:ietf:params:xml:ns:netconf:base:1.0"
xmlns:ns2="urn:ietf:params:xml:ns:netconf:notification:1.0">
<networks>
<network>
<name>mgmt-net</name>
<subnet>
<name>mgmt-net-subnet</name>
<ipversion>ipv4</ipversion>
<dhcp>false</dhcp>
<address>10.20.0.0</address>
<gateway>10.20.0.1</gateway>
<dns>
<server>24.0.0.23</server>
<server>25.0.0.35</server>
</dns>
<netmask>255.255.255.0</netmask>
</subnet>
</network>
</networks>
</esc_datamodel>
 </config>
 </edit-config>
 </rpc>
```

For Netconf Request for modifying the order of DNS entries, use nc:operation="replace" as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<esc_datamodel xmlns="http://www.cisco.com/esc/esc"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
<networks>
<network>
<name>test-network2 </name>
<shared>false</shared>
<admin_state>true</admin_state>
<router_external>false</router_external>
<provider_physical_network>physnet_tenant</provider_physical_network>
<provider_network_type>vlan</provider_network_type>
<provider_segmentation_id>3112</provider_segmentation_id>
<subnet>
<name>test-subnet2</name>
<ipversion>ipv4</ipversion>
<dhcp>false</dhcp>
<address>40.10.11.22</address>
<netmask>255.255.255.0</netmask>
<gateway>40.10.11.1</gateway>
<dns nc:operation="replace">
<server>25.0.0.1</server>
<server>24.0.0.1</server>
</dns>
</subnet>
</network>
</networks>
</esc_datamodel>
```

For Netconf Request to delete any existing DNS Name Server entry, use nc:operation="delete" as follows:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<esc_datamodel xmlns="http://www.cisco.com/esc/esc"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
<networks>
<network>
<name>network-new-1</name>
<shared>false</shared>
<admin_state>true</admin_state>
<router_external>false</router_external>
<provider_physical_network>physnet_tenant</provider_physical_network>
<provider_network_type>vlan</provider_network_type>
<provider_segmentation_id>3112</provider_segmentation_id>
<subnet>
<name>subnet-new-1</name>
<ipversion>ipv4</ipversion>
<dhcp>false</dhcp>
<address>40.10.11.3</address>
<netmask>255.255.255.0</netmask>
<gateway>40.10.11.1</gateway>
<dns>
<server nc:operation="delete"> 24.0.0.1</server>
<server nc:operation="delete">25.0.0.1</server>
<server> 26.0.0.1 </server>
</dns>
</subnet>
</network>
</networks>
</esc_datamodel>
```

6.1.14.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.14.3 Configuration Activation

On Success:

Event notification

An escEvent of type **CREATE_SUBNET** *with a status of* **SUCCESS** *will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.*

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
<eventTime>2015-05-19T20:24:32.57+00:00</eventTime>
<escEvent xmlns="http://www.cisco.com/esc/esc">
<status>SUCCESS</status>
<status_message>Subnet creation completed successfully, subnet ID: [SystemAdminTenantIdmgmt-netmgmt-net-subnet]</status_message>
<network>SystemAdminTenantIdmgmt-net</network>
<subnet>SystemAdminTenantIdmgmt-netmgmt-net-subnet</subnet>
<tenant>SystemAdminTenantId</tenant>
```

```
<vm_source>
</vm_source>
<vm_target>
</vm_target>
<event>
<type>CREATE_SUBNET</type>
</event>
</escEvent>
</notification>
```

On Failure:

Event notification

An escEvent of type **CREATE_ SUBNET** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. If a **FAILURE** event occurs, there may be cleanup required as described below under *Handling Activation Failures*

Handling Activation Failures

*If a **failure** occurs while activating a Create Subnet configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Subnet configuration change. A Delete Subnet sent at this stage should return an **<ok>** status and will also generate a DELETE_SUBNET Success Notification. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.*

6.1.15 Delete Subnet

6.1.15.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <networks>
          <network>
            <name>mgmt-net</name>
            <subnet nc:operation="delete">
              <name>mgmt-net-subnet</name>
            </subnet>
          </network>
        </networks>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.15.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.15.3 Configuration Activation

On Success:

Event notification

An escEvent of type **DELETE_SUBNET** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:57:06.526+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>OpenStack Driver: Subnet successfully deleted</status_message>
    <network>SystemAdminTenantIdmgmt-net</network>
    <subnet>SystemAdminTenantIdmgmt-netmgmt-net-subnet</subnet>
    <tenant>SystemAdminTenantId</tenant>
    <vm_source>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>DELETE_SUBNET</type>
    </event>
  </escEvent>
</notification>
```

On Failure:

Event notification
An escEvent of type **DELETE_SUBNET** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the configuration resource were already deleted from the VIM and not from the ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures
If a **failure** occurs while activating a delete subnet configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.16 Create Image

Creates an Image(Template) which will be managed by ESC and can be used for creating instance VMs. An optional properties list can be included in the image creation payload. This is only supported for the creation of images on OpenStack. Image properties will be stored in OpenStack as image metadata. Property name and values are not validated by ESC.

6.1.16.1 Netconf Request

6.1.16.1.1 Example One

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <images>
          <image>
            <name>cirros-image-indep</name>
            <src>file://cisco/images/cirros-0.3.3-x86_64-disk.img</src>
            <disk_format>qcow2</disk_format>
            <container_format>bare</container_format>
            <serial_console>true</serial_console>
            <disk_bus>virtio</disk_bus>
          </image>
        </images>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.16.1.2 Example Two

The use of image properties allows flexible assignment of image metadata, such as hw_disk_bus and *hw_vif_model*. This extends current limitation of ESC schema with *disk_bus := ide | scsi | virtio* and *e1000_net := true | false* and *virtio_net : = true | false*.

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <images>
          <image>
            <name>cirros-image-indep</name>
            <src>file://cisco/images/cirros-0.3.3-x86_64-disk.img</src>
            <disk_format>qcow2</disk_format>
            <container_format>bare</container_format>
            <serial_console>true</serial_console>
            <disk_bus>virtio</disk_bus>
            <properties>
              <property>
                <name>hw_disk_bus</name>
                <value>pcnet</value>
              </property>
              <property>
                <name>hw_vif_model</name>
                <value>pcnet</value>
```

```
            </property>
          </properties>
        </image>
      </images>
    </esc_datamodel>
  </config>
 </edit-config>
</rpc>
```

6.1.16.2 Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.16.3 Configuration Activation

On Success:

Event notification
An escEvent of type **CREATE_IMAGE** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-05T19:38:27.71+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message> Image creation completed successfully.</status_message>
    <image>cirros-image-indep</image>
    <vm_source>
  </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>CREATE_IMAGE</type>
    </event>
  </escEvent>
</notification>
```

Operational data
After an image creation configuration has been successfully activated, the operational data for the image will show the name, image_id and visibility of the image:

Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <filter select=" esc_datamodel/opdata/images/image[name='cirros-image-
indep']" type="xpath"/>
  </get>
</rpc>
```

Netconf Response
```
<rpc-reply message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <opdata>
        <images>
          <image>
            <name>cirros-image-indep</name>
```

```
            <image_id>660088a1-c38a-46b4-9dce-5b7f543ac137</image_id>
            <public>true</public>
          </image>
        </images>
      </opdata>
    </esc_datamodel>
  </data>
</rpc-reply>
```

On Failure:

Event notification
An escEvent of type **CREATE_IMAGE** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. If a **FAILURE** event occurs, there may be cleanup required as described below under *Handling Activation Failures*

Operational data
After an image creation configuration has failed activation, there will be no change to the operational data.

Handling Activation Failures
If a ***failure*** occurs while activating a Create Image configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Image configuration change. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.17 Delete Image

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <images>
          <image nc:operation="delete">
            <name>cirros-image-indep</name>
          </image>
        </images>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.17.2 Netconf Response

An ***rpc-reply*** response is returned with a status of ***ok*** if the request was accepted for activation, or a status of ***rpc-error*** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.17.3 Configuration Activation

On Success:

Event notification

An escEvent of type ***DELETE_IMAGE*** with a status of ***SUCCESS*** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully deleted in the VIM.
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-06T16:33:27.197+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Image deletion completed successfully.</status_message>
    <image>cirros-image-indep</image>
    <vm_source>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>DELETE_IMAGE</type>
    </event>
  </escEvent>
</notification>
```

Operational data

After an image deletion configuration has been successfully activated, there will be no operational data for the image.

On Failure:

Event notification

An escEvent of type ***DELETE_IMAGE*** with a status of ***FAILURE*** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the

configuration resource was already deleted in the VIM and was not done from ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Operational data

After an image deletion configuration has failed activation, there still will be no operational data because by default whenever a delete configuration fails then ESC cleans up the resources from its database.

Handling Activation Failures

If a **failure** occurs while activating a delete image configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.18 Create Flavor

6.1.18.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <flavors>
          <flavor>
            <name>myflavor</name>
            <vcpus>1</vcpus>
            <memory_mb>512</memory_mb>
            <root_disk_mb>0</root_disk_mb>
            <ephemeral_disk_mb>0</ephemeral_disk_mb>
            <swap_disk_mb>0</swap_disk_mb>
          </flavor>
        </flavors>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.18.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request** for more details.

Note – Flavor Operations (Create and Delete) are not supported for VMWare VIM !

6.1.18.3 Configuration Activation

On Success:

Event notification

An escEvent of type **CREATE_FLAVOR** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-05T19:38:27.71+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message> Flavor creation completed successfully.</status_message>
    <flavor>myflavor</flavor>
    <vm_source>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>CREATE_FLAVOR</type>
    </event>
  </escEvent>
</notification>
```

Operational data

After a flavor creation configuration has been successfully activated, the operational data for the flavor will show the name, flavor_id and visibility of the flavor:

Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <filter select=" esc_datamodel/opdata/flavors/flavor[name='myflavor']"
type="xpath"/>
  </get>
</rpc>
```

Netconf Response
```
<rpc-reply message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <opdata>
        <flavors>
          <flavor>
            <name>myflavor</name>
            <flavor_id>db0209a5-cf8a-4eaa-89a1-64511519486a</flavor_id>
            <public>true</public>
          </flavor>
        </flavors>
      </opdata>
    </esc_datamodel>
  </data>
</rpc-reply>
```

On Failure:

Event notification

An escEvent of type **CREATE_FLAVOR** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. If a **FAILURE** event occurs, there may be cleanup required as described below under *Handling Activation Failures*

Operational data

After a flavor creation configuration has failed activation, there will be no change to the operational data.

Handling Activation Failures

If a *failure* occurs while activating a Create Flavor configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Flavor configuration change. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.19 Delete Flavor

6.1.19.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <flavors>
          <flavor nc:operation="delete">
            <name>myflavor</name>
          </flavor>
        </flavors>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.19.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.19.3 Configuration Activation

On Success:

Event notification

An escEvent of type **DELETE_FLAVOR** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully deleted in the VIM.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-06T16:33:27.197+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Flavor deletion completed successfully.</status_message>
    <flavor>myflavor</flavor>
    <vm_source>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>DELETE_FLAVOR</type>
    </event>
  </escEvent>
</notification>
```

Operational data

After a flavor deletion configuration has been successfully activated, there will be no operational data for the flavor.

On Failure:

Event notification

An escEvent of type **DELETE_FLAVOR** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the

configuration resource was already deleted in the VIM and was not done from ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Operational data
After a flavor deletion configuration has failed activation, there still will be no operational data because by default whenever a delete configuration fails then ESC cleans up the resources from its database.

Handling Activation Failures
If a **failure** occurs while activating a delete flavor configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.20 Create Volume

6.1.20.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <tenants>
          <tenant>
            <name>admin</name>
            <volumes>
              <volume>
                <name>some-volume</name>
                <type>lvm</type>
                <size>1</size>
                <sizeunit>GiB</sizeunit>
              </volume>
            </volumes>
          </tenant>
        </tenants>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.20.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.20.3 Configuration Activation

On Success:

Event Notification

An escEvent of type **CREATE_VOLUME** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-18T19:46:12.037+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Volume successfully created.</status_message>
    <volume>some-volume</volume>
    <tenant>admin</tenant>
    <event>
      <type>CREATE_VOLUME</type>
    </event>
  </escEvent>
</notification>
```

After a volume creation configuration has been successfully activated, the operational data for the volume will show the display_name, external_id, type, and size of the volume:

```
<rpc-reply message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
   <data>
     <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
       <opdata>
         <tenants>
           <tenant>
             <name>admin</name>
             <tenant_id>ca50e51bc0894e58b334eeb586dd6bd7</tenant_id>
             <volumes>
               <volume>
                 <display_name>some-volume</display_name>
                 <external_id>aed7adeb-e31d-4fc8-b8e9-e4f9ee58afee</external_id>
                 <type>lvm</type>
                 <size>1GiB</size>
               </volume>
             </volumes>
           </tenant>
         </tenants>
       </opdata>
     </esc_datamodel>
   </data>
</rpc-reply>
```

On Failure:

Event notification

An escEvent of type **CREATE_VOLUME** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. If a **FAILURE** event occurs, there may be cleanup required as described below under *Handling Activation Failures*

Operational data

After a volume creation configuration has failed activation, there will be no change to the operational data.

Handling Activation Failures

If a **failure** occurs while activating a Create Volume configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Volume configuration change. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.21 Delete Volume

6.1.21.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <tenants>
          <tenant>
            <name>admin</name>
            <volumes>
              <volume nc:operation="delete">
                <name>some-volume</name>
              </volume>
            </volumes>
          </tenant>
        </tenants>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.21.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.21.3 Configuration Activation

On Success:

Event Notification
An escEvent of type **DELETE_VOLUME** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully deleted in the VIM.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-18T20:03:03.607+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Volume successfully deleted</status_message>
    <volume>some-volume</volume>
    <tenant>admin</tenant>
    <event>
      <type>DELETE_VOLUME</type>
    </event>
  </escEvent>
</notification>
```

Operational data
After a volume deletion configuration has been successfully activated, there will be no operational data for the volume.

On Failure:

An escEvent of type *DELETE_VOLUME* with a status of *FAILURE* will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the configuration resource were already deleted in the VIM and was not done from ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Operational data

After a volume deletion configuration has failed activation, there still will be no operational data because by default whenever a delete configuration fails then ESC cleans up the resources from its database.

Handling Activation Failures

If a **failure** occurs while activating a delete volume configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.22 Create File Server

6.1.22.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
  <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
   <file_servers>
    <file_server>
    <id>super_server</id>
    <base_url>http://10.81.103.24:/share/images</base_url>
    <file_server_user>admin_spec</file_server_user>
    <file_server_password>passwordForspec</file_server_password>
    </file_server>
   </file_servers>
  </esc_datamodel>
</config>
  </edit-config>
</rpc>
```

6.1.22.2 Netconf Response
An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.22.3 Configuration Activation

On Success:

Event Notification
An escEvent of type *CREATE_FILE_SERVER* with a status of *SUCCESS* will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in ESC.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-18T20:03:03.607+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>0</status_code>
    <status_message> File Server operation successful</status_message>
    <file_server_id>super_server</file_server_id>
    <event>
      <type>CREATE_FILE_SERVER</type>
    </event>
  </escEvent>
</notification>
```

NOTE – in the case of an update request (change to existing file server) the event type is *UPDATE_FILE_SERVER*.

On Failure:
An escEvent of type *CREATE_FILE_SERVER* with a status of *FAILURE* will be sent to Netconf subscribers if the configuration action cannot be complete for some reason.

6.1.23 Delete File Server

6.1.23.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
  <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
   <file_servers>
    <file_server nc:operation="delete">
    <id>super_server</id>
    <base_url>http://10.81.103.24:/share/images</base_url>
    <file_server_user>admin_spec</file_server_user>
    <file_server_password>passwordForspec</file_server_password>
    </file_server>
   </file_servers>
  </esc_datamodel>
</config>
  </edit-config>
</rpc>
```

6.1.23.2 Netconf Response

An *rpc-reply* response is returned with a status of **ok** if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.23.3 Configuration Activation

On Success:

Event Notification
An escEvent of type **DELETE_FILE_SERVER** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully deleted in ESC.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-18T20:03:03.607+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>0</status_code>
    <status_message> File Server operation successful</status_message>
    <file_server_id>super_server</file_server_id>
    <event>
      <type>DELETE_FILE_SERVER</type>
    </event>
  </escEvent>
</notification>
```

On Failure:
An escEvent of type **DELETE_FILE_SERVER** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason

6.1.24 Deploy Service

In Deploy service, northbound sends the request to do the deployment. ESC datamodel provides the detailed definition of the deployment request. In a single deployment, we can have multiple vm groups. Each vm group defines the vnf\vm level deployment details including interface,

image, flavor, scale, placement etc. The kpi\monitoring rules, events, recovery polices, redeploy policies, life cycle stage customization can all be configured with in a deployment. For a complete list of supported parameters, please refer the ESC datamodel.

A Deploy Service configuration request may contain multiple dependent workflows, in which case it can be referred to as a Unified Deployment. These workflows are:

- Create zero or one Tenant (if it does not already exist in ESC)
- Create zero or more Networks (if any networks are specified in the deployment)
- Create zero or more Subnets (if specified for any networks in the deployment)

Networks that are created as part of a Deploy Service workflow are referred to as "ephemeral networks", and the lifecycle of these networks is bound to the lifecycle of the Deployment in ESC. An Un-deploy Service workflow will automatically delete any networks and subnets that were originally created during the Deploy Service workflow.

Tenants that are created during a Deploy Service workflow are NOT deleted when the service is undeployed.

6.1.24.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <tenants>
          <tenant>
            <name>vnf-tenant</name>
            <deployments>
              <deployment>
                <name>csr-dep</name>
                <networks>
                  <network>
                    <name>mk-yesc-net-u</name>
                    <shared>false</shared>
                    <admin_state>true</admin_state>
                    <subnet>
                      <name>mk-yesc-subnet-u</name>
                      <ipversion>ipv4</ipversion>
                      <dhcp>true</dhcp>
                      <address>10.91.90.0</address>
                      <netmask>255.255.255.0</netmask>
                      <gateway>10.91.90.1</gateway>
                    </subnet>
                  </network>
                </networks>
                <vm_group>
                  <name>csr-vm</name>
                  <bootup_time>600</bootup_time>
                   <reboot_time>300</reboot_time>
                  <recovery_wait_time>0</recovery_wait_time>
                  <interfaces>
                    <interface>
                      <nicid>0</nicid>
                      <network>esc-net</network>
                    </interface>
                    <interface>
                      <nicid>1</nicid>
                      <network>mk-yesc-net-u</network>
                    </interface>
                  </interfaces>
                  <kpi_data>
                    <kpi>
```

```xml
                            <event_name>VM_ALIVE</event_name>
                            <metric_value>1</metric_value>
                            <metric_cond>GT</metric_cond>
                            <metric_type>UINT32</metric_type>
                            <metric_collector>
                              <type>ICMPPing</type>
                              <nicid>0</nicid>
                              <poll_frequency>3</poll_frequency>
                              <polling_unit>seconds</polling_unit>
                              <continuous_alarm>false</continuous_alarm>
                            </metric_collector>
                        </kpi>
                        <kpi>
                            <event_name>VM_OVERLOADED</event_name>
                            <metric_value>1</metric_value>
                            <metric_cond>GE</metric_cond>
                            <metric_type>UINT32</metric_type>
                            <metric_collector>
                              <type>Memory</type>
                              <nicid>0</nicid>
                              <poll_frequency>3</poll_frequency>
                              <polling_unit>seconds</polling_unit>
                              <continuous_alarm>false</continuous_alarm>
                            </metric_collector>
                        </kpi>
                        <kpi>
                            <event_name>VM_UNDERLOADED</event_name>
                            <metric_value>99</metric_value>
                            <metric_cond>LE</metric_cond>
                            <metric_type>UINT32</metric_type>
                            <metric_collector>
                              <type>CPU</type>
                              <nicid>0</nicid>
                              <poll_frequency>3</poll_frequency>
                              <polling_unit>seconds</polling_unit>
                              <continuous_alarm>false</continuous_alarm>
                            </metric_collector>
                        </kpi>
                    </kpi_data>
                    <rules>
                        <admin_rules>
                            <rule>
                              <event_name>VM_ALIVE</event_name>
                              <action>>ALWAYS log</action>
                              <action>FALSE recover autohealing</action>
                              <action>TRUE servicebooted.sh</action>
                            </rule>
                            <rule>
                              <event_name>VM_OVERLOADED</event_name>
                              <action>ALWAYS log</action>
                            </rule>
                            <rule>
                              <event_name>VM_UNDERLOADED</event_name>
                              <action>ALWAYS log</action>
                            </rule>
                        </admin_rules>
                    </rules>
                    <config_data>
                        <configuration>
                            <dst>iosxe_config.txt</dst>
                            <file>file://cisco/images/csr_config.sh</file>
                        </configuration>
                    </config_data>
                    <scaling>
                        <min_active>1</min_active>
                        <max_active>5</max_active>
                        <elastic>true</elastic>
                    </scaling>
                </vm_group>
            </deployment>
        </deployments>
```

```
          </tenant>
        </tenants>
      </esc_datamodel>
  </config>
    </edit-config>
  </rpc>
```

6.1.24.2 Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.24.3 Configuration Activation

Workflow Aggregation:

For each dependent workflow specified in the configuration, a separate workflow is submitted. Refer to the specific workflow description for information on configuration activation of each of these optional workflows. As required, dependent workflows will be processed in the following order:

    Section 6.1.1: Create a Tenant (zero or one)
    Section 6.1.12: Create a Network for a Tenant (zero or more)
    Section 0: Create a Subnet for a Tenant (zero or more)

Multiple workflows of the same type are executed in parallel, and a failure in any workflow results in a Deploy Service activation failure once the remaining workflows of the same type have finished. Workflows of different types are processed in sequence, and a failure in any of these workflows will result in an immediate Deploy Service activation failure. Once all of these dependent workflows have been successfully activated, the Deploy Service workflow is activated.

On Success:

A successful Deploy Service workflow will trigger events and operational data changes for each of the dependent workflows, and for the Deploy Service workflow.

Event notification

A series of escEvent notifications with a SUCCESS status will be sent to Netconf subscribers once the individual workflows in the configuration activation have completed.

If the tenant was created, then an escEvent of type CREATE_TENANT will be sent. Refer to section 6.1.1 for details.

If any ephemeral networks were created, then an escEvent of type CREATE_NETWORK will be sent for each network. Refer to section 6.1.12 for details.

If any subnets for ephemeral networks were created, then an escEvent of type CREATE_SUBNET will be sent for each subnet. Refer to section 0 for details.

Once each VM in the deployment is successfully deployed in the VIM, an escEvent of type VM_DEPLOYED with a SUCCESS status will be sent (one per VM):

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-04-28T23:38:04.741+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>OpenStack Driver: VM successfully created, VM Name:
[csr-reg_12605_vnf-tenant_vnf-tenantcsr-depcsr-reg1.2_0_csr-
vm__0]</status_message>
    <depname>csr-dep</depname>
    <tenant>vnf-tenant</tenant>
    <depid>3e0d269a-c3a4-454a-832f-44e0528ed2c1</depid>
    <vm_group>csr-vm</vm_group>
```

```
        <vm_source>
           <vmid>9b252ece-7973-4b1f-832e-fe53c68fb963</vmid>

    <hostid>a2f7615e78330dd28697588ddfb9516504b19642f53d39d7cff4f6ab</hostid>
        </vm_source>
        <vm_target/>
        <event>
           <type>VM_DEPLOYED</type>
        </event>
     </escEvent>
   </notification>
```

Once each VM in the deployment can be reached by the VM Monitor, an escEvent of type VM_ALIVE with a SUCCESS status will be sent (one per VM):

```
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-04-28T23:38:21.479+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
                <status_message>VM_Alive event received, VM ID: [csr-reg_12605_vnf-
            tenant_vnf-tenantcsr-depcsr-reg1.2_0_csr-vm_0]</status_message>
                <depname>csr-dep</depname>
                <tenant>vnf-tenant</tenant>
                <depid>3e0d269a-c3a4-454a-832f-44e0528ed2c1</depid>
                <vm_group>csr-vm</vm_group>
                <vm_source>
                   <vmid>9b252ece-7973-4b1f-832e-fe53c68fb963</vmid>

            <hostid>a2f7615e78330dd28697588ddfb9516504b19642f53d39d7cff4f6ab</hostid>
                </vm_source>
                <vm_target/>
                <event>
                   <type>VM_ALIVE</type>
                </event>
             </escEvent>
           </notification>
```

Once all the VM's in the deployment are ALIVE, an escEvent of type SERVICE_ALIVE with a SUCCESS status will be sent:

```
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-04-28T23:38:21.656+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
            <status_message>Service group deployment completed
        successfully!</status_message>
            <depname>csr-dep</depname>
            <tenant>vnf-tenant</tenant>
            <depid>3e0d269a-c3a4-454a-832f-44e0528ed2c1</depid>
            <vm_source/>
            <vm_target/>
            <event>
               <type>SERVICE_ALIVE</type>
            </event>
         </escEvent>
       </notification>
```

Once the SERVICE_ALIVE event is sent, the Deploy Service configuration has been successfully activated.

Operational data

If the tenant was created, then it will show up in operational data. Refer to section 6.1.1 for details.
If any ephemeral networks were created, then they will show up in operational data. Refer to section 6.1.12 for details. NOTE: it is not possible to differentiate in operational data between regular Tenant networks, and ephemeral (Deployment) networks.
If any subnets for ephemeral networks were created, then they will show up in operational data. Refer to section 0 for details.

When the Deploy Service completes successfully, the deployment will appear in the operational data. A Netconf request can be sent using the ***get*** method with an appropriate filter to query the operational data of the deployment:

Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
   <get>
     <filter select="esc_datamodel/opdata/tenants/tenant[name='vnf-
tenant']/deployments[deployment_name='csr-dep']" type="xpath"/>
   </get>
</rpc>
```

Netconf Response
```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
   <data>
     <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
       <opdata>
         <tenants>
           <tenant>
             <name>vnf-tenant</name>
             <deployments>
               <deployment_name>csr-dep</deployment_name>
               <service_name>-</service_name>
               <service_version>-</service_version>
               <deployment_id>vnf-tenantcsr-depcsr-reg1.2</deployment_id>
               <vm_group>
                 <name>csr-vm</name>
                 <vm_instance>
                   <vm_id>0bee67cc-f415-4f6a-95fe-e00e5d8d7c57</vm_id>
                   <name>csr-reg__12605_vnf-tenant__vnf-tenantcsr-depcsr-
reg1.2__0__csr-vm_0</name>

<host_id>109ec6a9b7c4613e5b73942e8cc998ebd9434a17c552e5e01847e402</host_id>
                   <hostname>compute-host-1</hostname>
                   <interfaces>
                     <interface>
                       <nicid>0</nicid>
                       <port_id>66ba846f-c02a-4c2b-964b-
4572d938b5e4</port_id>
                       <network>7af5c7df-6246-4d53-91bd-
aa12a1607656</network>
                       <subnet>7cb6815e-3023-4420-87d8-2b10efcbe14e</subnet>
                       <ip_address>192.168.0.58</ip_address>
                       <mac_address>fa:16:3e:c0:fd:49</mac_address>
                     </interface>
                     <interface>
                       <nicid>1</nicid>
                       <port_id>f6a1d46d-d5ad-4b7e-a48a-
3d539a920994</port_id>
                       <network>a39af676-5004-4f2d-8b7b-
d4c804645dc3</network>
                       <subnet>de4625ad-5465-4812-ab9c-de4a0ed21063</subnet>
                       <ip_address>10.91.90.2</ip_address>
                       <mac_address>fa:16:3e:64:8c:a6</mac_address>
                     </interface>
                   </interfaces>
                 </vm_instance>
               </vm_group>
               <state_machine>
                 <state>SERVICE_ACTIVE_STATE</state>
                 <vm_state_machines>
                   <vm_state_machine>
                     <vm_name> csr-reg__12605_vnf-tenant__vnf-tenantcsr-
depcsr-reg1.2__0__csr-vm_0</vm_name>
                     <state>VM_ALIVE_STATE</state>
                   </vm_state_machine>
```

```
                </vm_state_machines>
              </state_machine>
            </deployments>
          </tenant>
        </tenants>
      </opdata>
    </esc_datamodel>
  </data>
</rpc-reply>
```

On Failure:

Event notification

A series of escEvent notifications may be sent to Netconf subscribers once the individual workflows in the configuration activation have completed.

Workflows of different types in the configuration activation run in sequence. If an activation failure occurs in one of these workflows, and the appropriate escEvent with a FAILURE status is sent, then the Service Deploy workflow is aborted and no more workflows will be processed.

Multiple workflows of the same type will be processed in parallel, and a failure in any such workflow results in the Service Deploy workflow being aborted once the remaining parallel workflows have finished.

If a tenant activation was attempted, then a CREATE_TENANT escEvent with either a SUCCESS or FAILURE status will be sent describing the outcome of that workflow. Refer to section 6.1.1 for details.

If any ephemeral network activations were attempted, then a CREATE_NETWORK escEvent with either a SUCCESS or FAILURE status will be sent for each network, describing the outcome of each workflow. Refer to section 6.1.12 for details.

If any subnet activations for ephemeral networks were attempted, then a CREATE_SUBNET escEvent with either a SUCCESS or FAILURE status will be sent for each subnet, describing the outcome of each workflow. Refer to section 0 for details.

An escEvent notification of type SERVICE_ALIVE with a FAILURE status will be sent to Netconf subscribers if the configuration action cannot be completed for some reason. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures.*

Operational data

After a deploy service configuration has failed activation, there may still be operational data for any dependent workflows that completed successfully.

If the tenant was successfully created, then it will show up in operational data. Refer to section 6.1.1 for details.

If any ephemeral networks were created, then they will show up in operational data. Refer to section 6.1.12 for details. NOTE: it is not possible to differentiate in operational data between regular Tenant networks, and ephemeral (Deployment) networks.

If any subnets for ephemeral networks were created, then a CREATE_SUBNET escEvent will be sent for each subnet. Refer to section 0 for details.

There still will be operational data for the deployment itself but will have missing information.

Handling Activation Failures

If a FAILURE event occurs while activating a deploy service configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Undeploy Service configuration change. An Undeploy Service configuration change sent at this stage should return an **<ok>** status and may generate Notifications for any resource that requires cleanup.

The Deploy Service configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

Note that a tenant will never be removed by an Undeploy Service workflow, even if it was created initially by the corresponding Deploy Service workflow.

6.1.25 Un-deploy Service

An un-deploy Service configuration request may contain multiple dependent workflows, in which case it can be referred to as a Unified un-deployment. These workflows are:

- Delete zero or more Subnets (if specified for any networks in the deployment)
- Delete zero or more Networks (if any networks are specified in the deployment)

Tenants that are created during a Deploy Service workflow are NOT deleted when the service is undeployed.

6.1.25.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <tenants>
          <tenant>
            <name>vnf-tenant</name>
            <deployments>
              <deployment nc:operation="delete">
                <name>csr-dep</name>
              </deployment>
            </deployments>
          </tenant>
        </tenants>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.25.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request** for more details.

6.1.25.3 Configuration Activation

Workflow Aggregation:

For each dependent delete workflow specified in the configuration, a separate workflow is submitted. Refer to the specific workflow description for information on configuration activation of each of these optional workflows. The undeployment starts with undeploying the service VMs first then it moves onto deleting the dependent resource objects and will be processed in the following order:

    Section 06: Delete a Subnet for a Tenant (zero or more)
    Section 6.1.124: Delete a Network for a Tenant (zero or more)

Multiple workflows of the same type are executed in parallel, and a failure in any workflow results in a Undeploy Service activation failure once the remaining workflows of the same type have finished. Workflows of different types are processed in sequence, and a failure in any of these workflows will result in an immediate undeploy Service activation failure.

A successful Undeploy Service workflow will trigger events and operational data changes for each of the dependent workflows, and for the undeploy Service workflow.

Event notification

A series of escEvent notifications with a SUCCESS status will be sent to Netconf subscribers once the individual workflows in the configuration activation have completed.

Once each VM in the deployment is successfully undeployed from the VIM, an escEvent of type VM_UNDEPLOYED with a SUCCESS status will be sent (one per VM):

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T20:48:23.908+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>OpenStack Driver: VM successfully
deleted</status_message>
    <depname>csr-dep</depname>
    <tenant>vnf-tenant</tenant>
    <depid>62983966-ea7d-40ea-ba83-994b0b9a6357</depid>
    <vm_group>csr-vm</vm_group>
    <vm_source>
      <vmid>56c4a68f-e79f-4ada-9a59-7bf2b30e3e9e</vmid>

<hostid>c3efa32d511913f8af331959886a94d3c378501266e4fa931915a6d9</hostid>
    </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>VM_UNDEPLOYED</type>
    </event>
  </escEvent>
</notification>
```

If any subnets for ephemeral networks were deleted, then an escEvent of type DELETE_SUBNET will be sent for each subnet. Refer to section 06 for details.

If any ephemeral networks were deleted, then an escEvent of type DELETE_NETWORK will be sent for each network. Refer to section 6.1.124 for details.

Once all the VMs in the deployment and dependent resource objects are undeployed and deleted respectively, an escEvent of type SERVICE_UNDEPLOYED with a SUCCESS status will be sent:

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T20:48:24.467+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Service group undeployment completed
successfully</status_message>
    <depname>csr-dep</depname>
    <tenant>vnf-tenant</tenant>
    <depid>62983966-ea7d-40ea-ba83-994b0b9a6357</depid>
    <vm_source>
  </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>SERVICE_UNDEPLOYED</type>
    </event>
  </escEvent>
</notification>
```

Once the SERVICE_UNDEPLOYED event is sent, the undeploy Service configuration has been successfully activated.

Operational data

All of the resource objects and service VMs that have been deleted as part of undeployment will be removed from operational data.

On Failure:

Event notification

Workflows of different types in the configuration activation run in sequence. If an activation failure occurs in one of these workflows, the Service undeploy workflow is then aborted and no more workflows will be processed. Along with the abort, an escEvent of type SERVICE_UNDEPLOYED with a FAILURE status is sent.

Operational data

After an undeploy service configuration has failed activation, there will be no operational data for any dependent workflows nor the deployment itself (See Handling Activation Failures).

Handling Activation Failures

If a FAILURE event occurs while activating a undeploy service configuration change there is no need to take any further actions as ESC has already cleaned up its database. Operator may need to manually remove the resources from the VIM as the VIM may not have deleted them successfully.

6.1.26 Update Service

Update service allows you to incrementally add VNFs to a deployment. Update service requires a service registration with all of the potential VNFs that may potentially be used in the future even when they will not be used right away. Whenever a VNF is to be deployed then the min active under the desired VNF (vm_group) must be set to 1 and a configuration file has to be provided. The VNFs that are not going to be deployed must have their min active set to 0 and their interfaces to N/A as well as their configuration file set to N/A.

Refer to the deployment section to do an initial deployment before doing the update deployment. The original deployment will only have one active VNF and that can be seen in the operational data. Once update service is completed, another VNF will be added to the operational data.

6.1.26.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <tenants>
          <tenant>
            <name>vnf-tenant</name>
            <deployments>
              <deployment>
                <name>csr-dep</name>
                <vm_group>
                  <name>csr-vm</name>
                  <bootup_time>600</bootup_time>
                  <recovery_wait_time>0</recovery_wait_time>
                  <interfaces>
                    <interface>
                      <nicid>0</nicid>
                      <network>7af5c7df-6246-4d53-91bd-
aa12a1607656</network>
                    </interface>
```

```xml
                        </interfaces>
                        <kpi_data>
                          <kpi>
                            <event_name>VM_ALIVE</event_name>
                            <metric_value>50</metric_value>
                            <metric_cond>GT</metric_cond>
                            <metric_type>UINT32</metric_type>
                            <metric_occurrences_true>3</metric_occurrences_true>
<metric_occurrences_false>3</metric_occurrences_false>
                            <metric_collector>
                              <type>ICMPPing</type>
                              <nicid>0</nicid>
                              <poll_frequency>15</poll_frequency>
                              <polling_unit>seconds</polling_unit>
                              <continuous_alarm>false</continuous_alarm>
                            </metric_collector>
                          </kpi>
                        </kpi_data>
                        <rules>
                          <admin_rules                          <admin_rules>
                            <rule                          <rule>
                              <event_name>VM_ALIVE</event_name>
                              <action>ALWAYS log</action>
                              <action>FALSE recover autohealingFALSE recover
autohealing</action>
                              <action>TRUE servicebooted.sh</action>
                            </rule>
                          </admin_rules>
                        </rules>
                        <config_data>
                          <configuration>
                            <dst>iosxe_config.txt</dst>
</dst>
                            <file>file://cisco/images/csr_config.sh</file>
                          </configuration>
                        </config_data>
                        <scaling>
                          <min_active>1</min_active>
                          <max_active>1</max_active>
                          <elastic>true</elastic>
                        </scaling>
                      </vm_group>
                      <vm_group>
                        <name>wsa-vm</name>
                        <bootup_time>600</bootup_time>
                        <recovery_wait_time>0</recovery_wait_time>
                        <interfaces>
                          <interface>
                            <nicid>0</nicid>
                            <network>7af5c7df-6246-4d53-91bd-
aa12a1607656</network>
                          </interface>
                        </interfaces>
                        <kpi_data>
                          <kpi>
                            <event_name>VM_ALIVE</event_name>
                            <metric_value>50</metric_value>
                            <metric_cond>GT</metric_cond>
                            <metric_type>UINT32</metric_type>
                            <metric_occurrences_true>3</metric_occurrences_true>
<metric_occurrences_false>3</metric_occurrences_false>
                            <metric_collector>
                              <type>ICMPPing</type>
                              <nicid>0</nicid>
                              <poll_frequency>15</poll_frequency>
                              <polling_unit>seconds</polling_unit>
                              <continuous_alarm>false</continuous_alarm>
                            </metric_collector>
                          </kpi>
```

```xml
            </kpi_data>
            <rules>
               <admin_rules>
                  <rule>
                     <event_name>VM_ALIVE</event_name>
                     <action>ALWAYS log</action>
                     <action>FALSE recover autohealing</action>
                     <action>TRUE servicebooted.sh</action>
                  </rule>
               </admin_rules>
            </rules>
            <config_data>
               <configuration>
                  <dst>iosxe_config.txt</dst>
                  <file>file://cisco/images/csr_config.sh</file>
               </configuration>
            </config_data>
            <scaling>
               <min_active>1</min_active>
               <max_active>1</max_active>
               <elastic>true</elastic>
            </scaling>
         </vm_group>
         <vm_group>
            <name>asa-vm</name>
            <bootup_time>600</bootup_time>
            <recovery_wait_time>0</recovery_wait_time>
            <interfaces>
               <interface>
                  <nicid>0</nicid>
                  <network>N/A</network>
               </interface>
            </interfaces>
            <kpi_data>
               <kpi>
                  <event_name>VM_ALIVE</event_name>
                  <metric_value>50</metric_value>
                  <metric_cond>GT</metric_cond>
                  <metric_type>UINT32</metric_type>
                  <metric_occurrences_true>3</metric_occurrences_true>
<metric_occurrences_false>3</metric_occurrences_false>
                  <metric_collector>
                     <type>ICMPPing</type>
                     <nicid>0</nicid>
                     <poll_frequency>15</poll_frequency>
                     <polling_unit>seconds</polling_unit>
                     <continuous_alarm>false</continuous_alarm>
                  </metric_collector>
               </kpi>
            </kpi_data>
            <rules>
               <admin_rules>
                  <rule>
                     <event_name>VM_ALIVE</event_name>
                     <action>ALWAYS log</action>
                     <action>FALSE recover autohealing</action>
                     <action>TRUE servicebooted.sh</action>
                  </rule>
               </admin_rules>
            </rules>
            <config_data>
               <configuration>
                  <dst>iosxe_config.txt</dst>
                  <file>N/A</file>
               </configuration>
            </config_data>
            <scaling>
               <min_active>0</min_active>
               <max_active>0</max_active>
               <elastic>true</elastic>
```

```
                            </scaling>
                          </vm_group>
                        </deployment>
                      </deployments>
                    </tenant>
                  </tenants>
                </esc_datamodel>
          </config>
            </edit-config>

         </rpc>
```

6.1.26.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.26.3 Configuration Activation

On Success:
A successful update Service workflow will trigger events and operational data changes for the added VNF.

Event notification

The process for deploying a VM for the added VNF is the same as the deployment section including the notifications sent (see deployment section) such as a VM_DEPLOYED and VM_ALIVE escEvent with a success status.
Once all the VM's in the deployment are deployed, an escEvent of type SERVICE_UPDATED with a SUCCESS status will be sent:

```
          <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
            <eventTime>2015-05-19T20:48:24.467+00:00</eventTime>
            <escEvent xmlns="http://www.cisco.com/esc/esc">
              <status>SUCCESS</status>
              <status_message>Service group update completed
          successfully</status_message>
              <depname>csr-dep</depname>
              <tenant>vnf-tenant</tenant>
              <depid>62983966-ea7d-40ea-ba83-994b0b9a6357</depid>
              <vm_source>
          </vm_source>
              <vm_target>
          </vm_target>
              <event>
                 <type>SERVICE_UPDATED</type>
              </event>
            </escEvent>
          </notification>
```

Once the SERVICE_UPDATED event is sent, the update Service configuration has been successfully activated.

Operational data

When the update Service completes successfully, information about the newly added VNF will appear under the deployment in the operational data. A Netconf request can be sent using the **get** method with an appropriate filter to query the operational data of the updated deployment:

Netconf Request
```
          <rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
            <get>
```

```
     <filter select="esc_datamodel/opdata/tenants/tenant[name='vnf-
tenant']/deployments[deployment_name='csr-dep']" type="xpath"/>
   </get>
</rpc>
```

Netconf Response
```
<rpc-reply message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
      <opdata>
        <tenants>
          <tenant>
            <name>adouha_new</name>
            <tenant_id>5272fc863c10465cb8e92f58f55248cd</tenant_id>
            <deployments>
              <deployment_name>adouha_dep</deployment_name>
              <service_name>-</service_name>
              <service_version>-</service_version>
              <deployment_id>adouha_newadouha_depadouha_reg1.2</deployment_id>
              <vm_group>
                <name>ADOUHA_ASA</name>
              </vm_group>
              <vm_group>
                <name>ADOUHA_CSR</name>
                <vm_instance>
                  <vm_id>6d828cac-4ae2-4155-bbb3-aa8c1ec9d8ba</vm_id>

  <name>adouha_reg__79421__adouha_new__adouha_newadouha_depadouha_reg1.2__0__ADOUHA_CSR__0</na
                  <host_id>db373de8835b05cecf118129f9570bff4c058d6ec01696e8bd42241a</host_id
                  <hostname>my-ucs-3</hostname>
                  <interfaces>
                    <interface>
                      <nicid>0</nicid>
                      <port_id>3d47b2ee-2464-4f5e-832e-b3afaf86ec3d</port_id>
                      <network>7af5c7df-6246-4d53-91bd-aa12a1607656</network>
                      <subnet>7cb6815e-3023-4420-87d8-2b10efcbe14e</subnet>
                      <ip_address>192.168.0.22</ip_address>
                      <mac_address>fa:16:3e:fe:46:02</mac_address>
                    </interface>
                  </interfaces>
                </vm_instance>
              </vm_group>
              <vm_group>
                <name>ADOUHA_WSA</name>
                <vm_instance>
                  <vm_id>9925dbc0-5888-4a48-add0-b1baeb0a5d6c</vm_id>

  <name>adouha_reg__90903__adouha_new__adouha_newadouha_depadouha_reg1.2__0__ADOUHA_WSA__0</na
                  <host_id>0d2b1e68a0eaca50b7f7a5aafb331f319e15320a4fe2ca45f4197937</host_id
                  <hostname>my-ucs-5</hostname>
                  <interfaces>
                    <interface>
                      <nicid>0</nicid>
                      <port_id>88de389e-fe73-45d9-b20d-fea5ac9560df</port_id>
                      <network>7af5c7df-6246-4d53-91bd-aa12a1607656</network>
                      <subnet>7cb6815e-3023-4420-87d8-2b10efcbe14e</subnet>
                      <ip_address>192.168.0.221</ip_address>
                      <mac_address>fa:16:3e:10:7d:1e</mac_address>
                    </interface>
                  </interfaces>
                </vm_instance>
              </vm_group>
              <state_machine>
                <state>SERVICE_ACTIVE_STATE</state>
                <vm_state_machines>
                  <vm_state_machine>

  <vm_name>adouha_reg__79421__adouha_new__adouha_newadouha_depadouha_reg1.2__0__ADOUHA_CSR__0<
```

```
                        <state>VM_ALIVE_STATE</state>
                      </vm_state_machine>
                      <vm_state_machine>

        <vm_name>adouha_reg__90903__adouha_new__adouha_newadouha_depadouha_reg1.2__0__ADOUHA_WSA__0<
                        <state>VM_ALIVE_STATE</state>
                      </vm_state_machine>
                    </vm_state_machines>
                  </state_machine>
                </deployments>
              </tenant>
              <tenant>
                <name>admin</name>
                <tenant_id>331cb46738ed47cbbb0124181c729542</tenant_id>
              </tenant>
            </tenants>
          </opdata>
        </esc_datamodel>
      </data>
    </rpc-reply>
```

On Failure:

Event notification

A series of escEvents notification may be sent during an activation failure. The notifications will appear exactly the same as the deployment's failure cause (See the deployment's section for failure attempt). The workflow will be aborted and a final escEvent notification of type SERVICE_UPDATED with a FAILURE status is sent.

Operational data

After an update service configuration has failed activation, the operational data may or may not change depending on the timing of the failure.

Handling Activation Failures

If a FAILURE event occurs while activating an update service configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Undeploy Service configuration change. An Undeploy Service configuration change sent at this stage should return an ***<ok>*** status and may generate Notifications for any resource that requires cleanup. The Deploy and Update Service configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

There are 2 more notifications introduced since 5.3 release, they are VM_SET_MONITOR_STATUS and SVC_SET_MONITOR_STATUS notification. The two will emit after the SERVICE_UPDATED notification. VM_SET_MONITOR_STATUS notification indicating the status of setting monitor on the new monitoring agent for each VM in the VNF.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2020-08-06T14:04:47.124+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>VM monitor setting completed successfully.</status_message>
    <depname>test-dep</depname>
    <tenant_id>563fba7044c847a6a370cc10d5ef7d57</tenant_id>
    <depid>995f6849-0599-4287-bc3b-fca6de7bfcb2</depid>
    <vm_group>g1</vm_group>
    <vm_source
      <vmid>ca40ccb1-fe21-4846-a15f-79900e7e3baa</vmid>
      <vmname>test-dep_g1_0_88e9b2af-aef2-472c-84c1-1dbbf96df31f</vmname>
      <generated_vmname>test-dep_g1_0_88e9b2af-aef2-472c-84c1-
1dbbf96df31f</generated_vmname>
      <hostid>16e897fa14b3d1ecee0f7489a7a9ac7902f66c1f017437f27474a4c5</hostid>
```

```
          <hostname>my-ucs-3</hostname>
          <interfaces>
            <interface>
              <nicid>0</nicid>
              <type>virtual</type>
              <vim_interface_name>test-dep_g1_0_88e9b2af-aef2-472c-84c1-
1dbbf96df31f</vim_interface_name>
              <port_id>f8cc9d5b-6bb0-4050-98bd-8aa25d71a68c</port_id>
              <network>3d8a4b3d-6ced-4733-8143-6cea6da85411</network>
              <subnet>e0f2da9e-0c8d-4351-847a-1bf36cc3ffdc</subnet>
              <ip_address>172.29.0.9</ip_address>
              <mac_address>fa:16:3e:f6:3b:b7</mac_address>
              <netmask>255.255.240.0</netmask>
              <gateway>172.29.0.1</gateway>
            </interface>
          </interfaces>
          <properties>
            <property>
              <name>monitoring_agent</name>
              <value>dmonaName://test-dmona-dep-1</value>
            </property>
          </properties>
        </vm_source>
        <event>
          <type>VM_SET_MONITOR_STATUS</type>
        </event>
      </escEvent>
</notification>
```

SVC_SET_MONITOR_STATUS notification indicating the service level status of setting
monitor for a deployment.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2020-08-06T14:04:47.132+00:00</eventTime>
   <escEvent xmlns="http://www.cisco.com/esc/esc">
     <status>SUCCESS</status>
     <status_code>200</status_code>
     <status_message>Service monitor setting completed successfully.</status_message>
     <depname>test-dep</depname>
     <tenant>admin</tenant>
     <tenant_id>563fba7044c847a6a370cc10d5ef7d57</tenant_id>
     <depid>995f6849-0599-4287-bc3b-fca6de7bfcb2</depid>
     <monitoring>
       <vm_group>
         <name>g1</name>
         <monitoring_agent>dmonaName://test-dmona-dep-1</monitoring_agent>
         <status_message>VM group setting monitor completed
successfully.</status_message>
       </vm_group>
     </monitoring>
     <event>
       <type>SVC_SET_MONITOR_STATUS</type>
     </event>
   </escEvent>
</notification>
```

6.1.27 Deploy Multi-vim Service

In ESC 3.0, Multi-vim deployment support is added. As part of multi vim deployment, any deployment or
a vm group with in a deployment can be deployed in to any particular vim. To deploy VNFs on multiple
VIMs, below are the prerequisites.

- o   Configure the VIM connector and its credentials
- o   Create a tenant within ESC

A new locator attribute is introduced to configure the VIM details per vm group in a deployment. The locator will have reference to the VIM Connector and other details for deployment like Project name for Openstack. In ESC 3.0, Multi-VIM is supported only in Openstack VIM.

Locator Example:

```
<locator>
    <!--vim_id references the vim connector -->
    <vim_id>SiteA</vim_id>
    <!-- vim_project: OOB project/tenant that exist in the target VIM -->
    <vim_project>Project-X</vim_project>
</locator>
```

Note – Multi-vim Deployment is not supported for VMWare VIM in this release!

6.1.27.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <source>
      <running/>
    </source>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <tenants>
          <tenant>
            <name>esc-tenant</name>
            <vim_mapping>false</vim_mapping>
            <deployments>
              <deployment>
                <name>dep-1</name>
                <vm_group>
                  <name>g-1</name>
                  <locator>
                    <vim_id>openstack-vim</vim_id>
                    <vim_project>vim-project-A</vim_project>
                  </locator>
                  <bootup_time>150</bootup_time>
                  <recovery_wait_time>30</recovery_wait_time>
                  <flavor>Cirros-Flavor</flavor>
                  <image>Cirros-Image</image>
                  <interfaces>
                    <interface>
                      <nicid>0</nicid>
                      <network>net-A</network>
                    </interface>
                  </interfaces>
                  <scaling>
                    <min_active>1</min_active>
                    <max_active>1</max_active>
                    <elastic>true</elastic>
                  </scaling>
                  <kpi_data>
                    <kpi>
                      <event_name>VM_ALIVE</event_name>
                      <metric_value>1</metric_value>
                      <metric_cond>GT</metric_cond>
                      <metric_type>UINT32</metric_type>
                      <metric_collector>
                        <type>ICMPPing</type>
                        <nicid>0</nicid>
                        <poll_frequency>3</poll_frequency>
                        <polling_unit>seconds</polling_unit>
                        <continuous_alarm>false</continuous_alarm>
                      </metric_collector>
                    </kpi>
                  </kpi_data>
                  <rules>
                    <admin_rules>
                      <rule>
                        <event_name>VM_ALIVE</event_name>
```

```
                    <action>ALWAYS log</action>
                    <action>TRUE servicebooted.sh</action>
                    <action>FALSE recover autohealing</action>
                  </rule>
                </admin_rules>
              </rules>
              <config_data>
              </config_data>
            </vm_group>
          </deployment>
        </deployments>
      </tenant>
    </tenants>
  </esc_datamodel>
 </config>
</edit-config>
</rpc>
```

6.1.27.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.27.3 Configuration Activation

Workflow Aggregation:

On Success:

A successful Deploy Service workflow will trigger events and operational data changes for each of the dependent workflows, and for the Deploy Service workflow.

Event notification

A series of escEvent notifications with a SUCCESS status will be sent to Netconf subscribers once the individual workflows in the configuration activation have completed.
If the tenant was created, then an escEvent of type CREATE_TENANT will be sent. Refer to section 6.1.9 for details.
Once each VM in the deployment is successfully deployed in the VIM, an escEvent of type VM_DEPLOYED with a SUCCESS status will be sent (one per VM):

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-07-21T09:11:07.18+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>VM Deployed in a service deployment. VM Generated ID:
[dep-1_g-1_0_262d13cb-79b5-4590-9d3d-798b98358cae]</status_message>
    <depname>dep-1</depname>
    <tenant>esc-tenant</tenant>
    <depid>ad07d2fb-3f18-498c-a042-ce918302c05e</depid>
    <vm_group>g-1</vm_group>
    <vm_source>
      <vmid>c3d8e1d3-6022-49cf-981e-9512d4654f67</vmid>
      <vmname>dep-1_g-1_0_262d13cb-79b5-4590-9d3d-798b98358cae</vmname>
      <vim_id>openstack-vim</vim_id>
      <vim_project>vim-project-A</vim_project>
      <vim_project_id>d0a5aef54d4e4039b89e417ad4b05786</vim_project_id>

<hostid>f855a29efc17e31347db3bef6839cdc3875bc5523d443694f6af1917</hostid>
      <hostname>my-ucs-65</hostname>
      <interfaces>
        <interface>
          <nicid>0</nicid>
          <type>virtual</type>
```

```
                    <port_id>749afb16-85c8-4dc4-95cf-1f087105b002</port_id>
                    <network>c7fafeca-aa53-4349-9b60-1f4b92605420</network>
                    <subnet>7b2ce63b-eb20-4ff8-8d49-e46ee8dde0f5</subnet>
                    <ip_address>152.16.3.207</ip_address>
                    <mac_address>fa:16:3e:6f:ae:9f</mac_address>
                    <netmask>255.255.240.0</netmask>
                    <gateway>152.16.0.1</gateway>
                </interface>
            </interfaces>
        </vm_source>
        <event>
            <type>VM_DEPLOYED</type>
        </event>
    </escEvent>
</notification>
```

Once each VM in the deployment can be reached by the VM Monitor, an escEvent of type VM_ALIVE with a SUCCESS status will be sent (one per VM):

```
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
            <eventTime>2017-07-21T09:11:24.36+00:00</eventTime>
            <escEvent xmlns="http://www.cisco.com/esc/esc">
                <status>SUCCESS</status>
                <status_code>200</status_code>
                <status_message>VM_Alive event received during deployment, VM
Generated ID: [dep-1_g-1_0_262d13cb-79b5-4590-9d3d-
798b98358cae]</status_message>
                <depname>dep-1</depname>
                <tenant>esc-tenant</tenant>
                <depid>ad07d2fb-3f18-498c-a042-ce918302c05e</depid>
                <vm_group>g-1</vm_group>
                <vm_source>
                    <vmid>c3d8e1d3-6022-49cf-981e-9512d4654f67</vmid>
                    <vmname>dep-1_g-1_0_262d13cb-79b5-4590-9d3d-798b98358cae</vmname>
                    <vim_id>openstack-vim</vim_id>
                    <vim_project>vim-project-A</vim_project>
                    <vim_project_id>d0a5aef54d4e4039b89e417ad4b05786</vim_project_id>

        <hostid>f855a29efc17e31347db3bef6839cdc3875bc5523d443694f6af1917</hostid>
                    <hostname>my-ucs-65</hostname>
                    <interfaces>
                        <interface>
                            <nicid>0</nicid>
                            <type>virtual</type>
                            <port_id>749afb16-85c8-4dc4-95cf-1f087105b002</port_id>
                            <network>c7fafeca-aa53-4349-9b60-1f4b92605420</network>
                            <subnet>7b2ce63b-eb20-4ff8-8d49-e46ee8dde0f5</subnet>
                            <ip_address>152.16.3.207</ip_address>
                            <mac_address>fa:16:3e:6f:ae:9f</mac_address>
                            <netmask>255.255.240.0</netmask>
                            <gateway>152.16.0.1</gateway>
                        </interface>
                    </interfaces>
                </vm_source>
                <event>
                    <type>VM_ALIVE</type>
                </event>
            </escEvent>
        </notification>
```

Once all the VM's in the deployment are ALIVE, an escEvent of type SERVICE_ALIVE with a SUCCESS status will be sent:

```
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
            <eventTime>2017-07-21T09:11:24.415+00:00</eventTime>
            <escEvent xmlns="http://www.cisco.com/esc/esc">
                <status>SUCCESS</status>
                <status_code>200</status_code>
                <status_message>Service group deployment completed
successfully!</status_message>
                <depname>dep-1</depname>
```

```
        <tenant>esc-tenant</tenant>
        <tenant_id>esc-tenant</tenant_id>
        <depid>ad07d2fb-3f18-498c-a042-ce918302c05e</depid>
        <event>
           <type>SERVICE_ALIVE</type>
        </event>
      </escEvent>
   </notification>
```

Once the SERVICE_ALIVE event is sent, the Deploy Service configuration has been successfully activated.

Operational data
If the tenant was created, then it will show up in operational data. Refer to section 6.1.9 for details.
When the Deploy Service completes successfully, the deployment will appear in the operational data. A
Netconf request can be sent using the *get* method with an appropriate filter to query the operational
data of the deployment:

Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
   <get>
      <filter select="esc_datamodel/opdata/tenants/tenant[name='esc-
tenant']/deployments[deployment_name='dep-1']" type="xpath"/>
   </get>
</rpc>
```

Netconf Response
```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
   <data>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
         <opdata>
            <tenants>
               <tenant>
                  <name>esc-tenant</name>
                  <deployments>
                     <deployment_name>dep-1</deployment_name>
                     <deployment_id>esc-tenantdep-1</deployment_id>
                     <vm_group>
                        <name>g-1</name>
                        <vm_instance>
                           <vm_id>c3d8e1d3-6022-49cf-981e-9512d4654f67</vm_id>
                           <name>dep-1_g-1_0_262d13cb-79b5-4590-9d3d-
798b98358cae</name>
                           <vim_id>openstack-vim</vim_id>
                           <vim_project>vim-project-A</vim_project>

<vim_project_id>d0a5aef54d4e4039b89e417ad4b05786</vim_project_id>

<host_id>f855a29efc17e31347db3bef6839cdc3875bc5523d443694f6af1917</host_id>
                           <hostname>my-ucs-65</hostname>
                           <interfaces>
                              <interface>
                                 <nicid>0</nicid>
                                 <type>virtual</type>
                                 <port_id>749afb16-85c8-4dc4-95cf-
1f087105b002</port_id>
                                 <network>c7fafeca-aa53-4349-9b60-
1f4b92605420</network>
                                 <subnet>7b2ce63b-eb20-4ff8-8d49-e46ee8dde0f5</subnet>
                                 <ip_address>152.16.3.207</ip_address>
                                 <mac_address>fa:16:3e:6f:ae:9f</mac_address>
                                 <netmask>255.255.240.0</netmask>
                                 <gateway>152.16.0.1</gateway>
                              </interface>
                           </interfaces>
```

```
                </vm_instance>
              </vm_group>
              <state_machine>
                <state>SERVICE_ACTIVE_STATE</state>
                <vm_state_machines>
                  <vm_state_machine>
                    <vm_name>dep-1_g-1_0_262d13cb-79b5-4590-9d3d-
    798b98358cae</vm_name>
                    <state>VM_ALIVE_STATE</state>
                  </vm_state_machine>
                </vm_state_machines>
              </state_machine>
            </deployments>
          </tenant>
        </tenants>
      </opdata>
    </esc_datamodel>
  </data>
</rpc-reply>
```

On Failure:

Since deploy multi-vim service workflow is same as the normal deploy service workflow, refer to "On Failure" section of Deploy Service in 6.1.24.3 for details.

6.1.28 Deploy Service with configuration files retrieved from remote server with authentication.

ESC 3.1 supports external files to be used for day 0 config files, script files, metric monitoring script, etc. ESC downloads these files and uses it in deployment, monitoring, and life cycle stage actions. ESC adds support to securely downloading these files. To achieve this NB user should add a remote file server (see **section 6.1.21**) and then add a file locator as part of deployment. The file server will have the base URL and credentials to access the server. The file locator will reference file server and relative path to download the day 0 \ script file.

6.1.28.1 File Locators

File Locator config is part of deployment config, and it will reference the File Server to get the base URL and credentials. It contains a name (key), remote path to the resource (this is the rest of the URI to be concatenated with the base URL provided in the file server) , properties configurations and other optional fields. The File locators can be used under the following sections of the deployment datamodel:

- Deployment level LCS Policies
- VM Group level LCS Policies
- VM Group level Config data

Example:
```
                <file_locators>
                  <file_locator>
                    <name>configlocator-1</name> <!-- unique name -->
                    <remote_file>
                      <file_server_id>super_server</file_server_id>
                      <remote_path>/service_vm/csr_config.sh</remote_path>
                      <local_target>day0</local_target>
                      <properties>
                        <property>
                          <name>configuration_file</name>
                          <value>true</value>
                        </property>
                      </properties>
```

```
                            </remote_file>
                          </file_locator>
                        </file_locators>
```

6.1.28.2 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
   <edit-config>
      <source>
         <running/>
      </source>
      <config>
<esc_datamodel xmlns="http://www.cisco.com/esc/esc">
   <tenants>
      <tenant>
         <name>ASA-Tenant</name>
         <deployments>
            <deployment>
               <name>Dep-1</name>
               <policies>
                  <policy>
                     <name>VNFUPGRADE_POST_DEPLOY_ALIVE</name>
                     <conditions>
                        <condition>
                           <name>LCS::POST_DEPLOY_ALIVE</name>
                        </condition>
                     </conditions>
                     <actions>
                        <action>
                           <name>post_deploy_alive_action</name>
                           <type>SCRIPT</type>
                           <file_locators>
                              <file_locator>
                                 <name>post_deploy_alive_script</name>
                                 <remote_file>
                                    <file_server_id>super_server</file_server_id>

<remote_path>/share/qatest/vnfupgrade/lcspostdeployalive.sh</remote_path>
                                    <local_target>vnfupgrade/lcspostdepalive.sh</local_target>
                                    <persistence>FETCH_ALWAYS</persistence>
                                    <properties/>
                                 </remote_file>
                              </file_locator>
                           </file_locators>
                           <properties>
                              <property>
                                 <name>file_locator_name</name>
                                 <value>post_deploy_alive_script</value>
                              </property>
                           </properties>
                        </action>
                     </actions>
                  </policy>
               </policies>
               <vm_group>
                  <name>G1-ASA</name>
                  <image>Automation-ASA</image>
                  <flavor>m1.large</flavor>
                  <recovery_policy>
                     <max_retries>1</max_retries>
                  </recovery_policy>
                  <scaling>
                     <min_active>1</min_active>
                     <max_active>1</max_active>
                     <elastic>true</elastic>
                  </scaling>
                  <placement>
                     <type>affinity</type>
                     <enforcement>strict</enforcement>
                  </placement>
```

```xml
                    <bootup_time>120</bootup_time>
                    <recovery_wait_time>60</recovery_wait_time>
                    <interfaces>
                      <interface>
                        <nicid>0</nicid>
                        <network>esc-net</network>
                      </interface>
                    </interfaces>
                    <kpi_data>
                      <kpi>
                        <event_name>VM_ALIVE</event_name>
                        <metric_value>1</metric_value>
                        <metric_cond>GT</metric_cond>
                        <metric_type>UINT32</metric_type>
                        <metric_occurrences_true>1</metric_occurrences_true>
                        <metric_occurrences_false>5</metric_occurrences_false>
                        <metric_collector>
                          <nicid>0</nicid>
                          <type>ICMPPing</type>
                          <poll_frequency>5</poll_frequency>
                          <polling_unit>seconds</polling_unit>
                          <continuous_alarm>false</continuous_alarm>
                        </metric_collector>
                      </kpi>
                    </kpi_data>
                    <rules>
                      <admin_rules>
                        <rule>
                          <event_name>VM_ALIVE</event_name>
                          <action>ALWAYS log</action>
                          <action>TRUE servicebooted.sh</action>
                          <action>FALSE recover autohealing</action>
                        </rule>
                      </admin_rules>
                    </rules>
                    <config_data>
                      <configuration>
                        <dst>ASA.static.txt</dst>
                        <file_locators>
                          <file_locator>
                            <name>asa-day0-config</name>
                            <remote_file>
                              <file_server_id>super_server2</file_server_id>
                              <remote_path>/share/qatest/day0/asa_config.sh</remote_path>
                              <local_target>day0/asa_config.sh</local_target>
                              <properties>
                                <property>
                                  <!-- the property name "configuration_file" with value
"true" indicates this is the
                                    script to be used just as using the <file> member case
of the configuration -->
                                  <name>configuration_file</name>
                                  <value>true</value>
                                </property>
                              </properties>
                            </remote_file>
                          </file_locator>
                        </file_locators>
                      </configuration>
                    </config_data>
                  </vm_group>
                </deployment>
              </deployments>
            </tenant>
          </tenants>
        </esc_datamodel>
      </config>
    </edit-config>
</rpc>
```

6.1.28.3 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.28.4 Configuration Activation

6.1.28.4.1 Notification
The typical Deployment lifecycle notifications still apply. There is no additional fields for the file server or locator in the notification event.

6.1.29 Create Simple Router

6.1.29.1 Netconf Request

```
<?xml version="1.0" encoding="UTF-8"?>
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <routers>
          <router>
            <name>testRouter1</name>
          </router>
        </routers>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.29.2 Netconf Response
An rpc-reply response is returned with a status of ok if the request was accepted for activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details.

6.1.29.3 Netconf Response
An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.29.4 Configuration Activation

On Success:

An escEvent of type **CREATE_ROUTER** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
    <eventTime>2021-09-25T10:31:26.76+00:00</eventTime>
    <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Router successfully created.</status_message>
    <router>testRouter-1</router>
    <tenant>admin</tenant>
    <event>
        <type>CREATE_ROUTER</type>
    </event>
    </escEvent>
</notification>
```

On Failure:

Event notification
An escEvent of type **CREATE_ROUTER** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures
If a **failure** occurs while activating a Create Router configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Router configuration change. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.30   Create Router with interface

6.1.30.1 Netconf Request

```xml
<?xml version="1.0" encoding="UTF-8"?>
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running />
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <routers>
          <router>
            <name>testRouter</name>
            <admin_state>true</admin_state>
            <external_network>internet-net</external_network>
            <snat_enable>true</snat_enable>
            <distribution>false</distribution>
            <description>check for desc</description>
            <interfaces>
              <interface>
                <subnet>automation_subnet</subnet>
                <port_id>18b6e6df-fc48-49dc-842e-a1cee546173e</port_id>
              </interface>
            </interfaces>
            <static_routes>
              <route>
                <route_name>RouteA</route_name>
                <destination>172.26.0.0/24</destination>
                <next_hop>10.85.103.93</next_hop>
              </route>
            </static_routes>
          </router>
        </routers>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.30.2 Netconf Response
An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.30.3 Configuration Activation

On Success:

Event notification

An escEvent of type **CREATE_ROUTER** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
    <eventTime>2021-09-25T10:31:26.76+00:00</eventTime>
    <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Router successfully created.</status_message>
    <router>testRouter-1</router>
    <tenant>admin</tenant>
    <event>
        <type>CREATE_ROUTER</type>
    </event>
    </escEvent>
</notification>
```

On Failure:

Event notification

An escEvent of type **CREATE_ROUTER** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures

If a **failure** occurs while activating a Create Router configuration change, the Netconf client should explicitly bring the configuration back to a consistent state by sending the corresponding Delete Router configuration change. The configuration change can then be retried explicitly by the Netconf client once the underlying issue is resolved.

6.1.31 Delete Router

6.1.31.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
    <target>
      <running/>
    </target>
    <config>
      <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
        <routers>
          <router nc:operation="delete">
            <name>testRouter-1</name>
          </router>
        </routers>
      </esc_datamodel>
    </config>
  </edit-config>
</rpc>
```

6.1.31.2 Netconf Response

An ***rpc-reply*** response is returned with a status of ***ok*** if the request was accepted for activation, or a status of ***rpc-error*** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.31.3 Configuration Activation

On Success:

Event notification
An escEvent of type ***DELETE_ROUTER*** with a status of ***SUCCESS*** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T20:05:45.824+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Router successfully deleted</status_message>
    <router>testRouter-1</router>
    <tenant>admin</tenant>
    <event>
      <type>DELETE_ROUTER</type>
    </event>
  </escEvent>
</notification>
```

On Failure:

Event notification
An escEvent of type ***DELETE_ROUTER*** with a status of ***FAILURE*** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the configuration resource were already deleted in the VIM and was not done from ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures

If a **failure** occurs while activating a delete router configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.32 Update Router

6.1.32.1 Netconf Request

```
<?xml version='1.0' encoding='ASCII'?>
<esc_datamodel xmlns="http://www.cisco.com/esc/esc">
   <routers>
     <router>
       <name>testRouter</name>
       <admin_state>false</admin_state>
       <external_network>internet-net</external_network>
       <snat_enable>true</snat_enable>
       <distribution>false</distribution>
       <description>Router Creation</description>
       <interfaces>
         <interface>
           <subnet>automation_subnet</subnet>
         </interface>
       </interfaces>
       <static_routes>
          <route>
            <route_name>RouteA</route_name>
            <destination>172.26.0.0/24</destination>
            <next_hop>10.85.103.93</next_hop>
          </route>
       </static_routes>
     </router>
   </routers>
</esc_datamodel>
```

6.1.32.2 Netconf Response

An ***rpc-reply*** response is returned with a status of ***ok*** if the request was accepted for activation, or a status of ***rpc-error*** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.32.3 Configuration Activation

On Success:

Event notification
An escEvent of type **UPDATE_ROUTER** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2021-10-18T11:43:38.806+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>Router update completed successfully, Router ID: [6c538458-70d7-4ac5-a5e2-7d7d870ec792]</status_message>
   <router>testRouter</router>
   <tenant>admin</tenant>
   <event>
    <type>UPDATE_ROUTER</type>
   </event>
  </escEvent>
</notification>
```

On Failure:

Event notification
An escEvent of type **UPDATE_ROUTER** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the configuration resource were already deleted in the VIM and was not done from ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures
If a **failure** occurs while activating a delete router configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.33 Delete Static Route

6.1.33.1 Netconf Request
```xml
<?xml version='1.0' encoding='ASCII'?>
<esc_datamodel xmlns="http://www.cisco.com/esc/esc">
   <routers>
     <router>
       <name>testRouter</name>
       <admin_state>false</admin_state>
       <external_network>internet-net</external_network>
       <snat_enable>true</snat_enable>
```

```
          <distribution>false</distribution>
          <description>Router Creation</description>
          <interfaces>
            <interface>
              <subnet>automation_subnet</subnet>
            </interface>
          </interfaces>
          <static_routes>
             <route operation="delete">
              <route_name>RouteA</route_name>
              <destination>172.26.0.0/24</destination>
              <next_hop>10.85.103.93</next_hop>
            </route>
          </static_routes>
        </router>
      </routers>
</esc_datamodel>
```

6.1.33.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.33.3 Configuration Activation

On Success:

Event notification
An escEvent of type **DELETE_STATIC_ROUTE** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2021-10-18T11:55:55.35+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>Route successfully deleted</status_message>
   <router>testRouter</router>
   <destination>172.26.0.0/24</destination>
   <next_hop>10.85.103.93</next_hop>
   <event>
    <type>DELETE_STATIC_ROUTE</type>
   </event>
  </escEvent>
```

</notification></notification>

On Failure:

Event notification
An escEvent of type **DELETE_STATIC_ROUTE** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the configuration resource were already deleted in the VIM and was not done from ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures
If a **failure** occurs while activating a delete router configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.34 Detach Interface

6.1.34.1 Netconf Request
```
<?xml version='1.0' encoding='ASCII'?>
<esc_datamodel xmlns="http://www.cisco.com/esc/esc">
  <routers>
    <router>
      <name>testRouter</name>
      <admin_state>false</admin_state>
      <external_network>internet-net</external_network>
      <snat_enable>true</snat_enable>
      <distribution>false</distribution>
      <description>Router Creation</description>
      <interfaces>
        <interface operation="delete">
          <subnet>automation_subnet</subnet>
        </interface>
      </interfaces>
    </router>
  </routers>
</esc_datamodel>
```

6.1.34.2 Netconf Response
An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.34.3 Configuration Activation

On Success:

Event notification

An escEvent of type **DETACH_INTERFACE** with a status of **SUCCESS** will be sent to Netconf subscribers once the configuration activation has completed. This indicates that the activation workflow is complete, and the configuration resource has been successfully created in the VIM.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2021-10-18T11:59:36.465+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>RouterInterface successfully deleted</status_message>
   <router>testRouter</router>
   <router_interface>automation_subnet</router_interface>
   <event>
    <type>DETACH_INTERFACE</type>
   </event>
  </escEvent>
</notification>
```

On Failure:

Event notification

An escEvent of type **DETACH_INTERFACE** with a status of **FAILURE** will be sent to Netconf subscribers if the configuration action cannot be complete for some reason. For example, this could occur if the configuration resource were already deleted in the VIM and was not done from ESC. If a FAILURE event occurs, there may be cleanup required as described below under *Handling Activation Failures*.

Handling Activation Failures

If a **failure** occurs while activating a delete router configuration change, there are no further actions required to take as ESC will automatically clean up all the resources from its database. Operator manual intervention may be required to clean up possible leaking VIM resources.

6.1.35 Create Snapshot

It is possible to use both the Netconf API and the REST API to create a snapshot of an ESC managed VM. This creates both a snapshot image on OpenStack, and a volume snapshot if the ESC managed VM contains storage or bootable volumes.

6.1.35.1 Netconf Request

```xml
<?xml version="1.0" encoding="UTF-8"?>
<vmBackupAction xmlns="http://www.cisco.com/esc/esc">
    <vmName>new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-91b3-
1fc1187e6d0f</vmName>
    <backupName>daves-confd-backup</backupName>
```

```
                <actionType>SNAPSHOT</actionType>
            </vmBackupAction>
```

6.1.35.2 Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.1.35.3 Configuration Activation

On Success:

Event notification
Three escEvents with a status of **SUCCESS** will be sent to Netconf subscribers once the snapshot has completed.

The notifications are:

Notification	When the notification is sent
VM_BACKUP_INIT	When the API is invoked, and validation passed.
VM_BACKUP_CREATED	When OpenStack has successfully received and validated the snapshot create request.
VM_BACKUP_COMPLETE	When OpenStack has finished the snapshot create operation, and it was either a success, or an error occurred.

Shown below are examples of the three notifications:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2021-10-18T20:25:34.916+00:00</eventTime>
  <escEvent xmlns=http://www.cisco.com/esc/esc>
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>VM snapshot [new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-91b3-
1fc1187e6d0f] initializes.</status_message>
    <depname>new-deployment-name2</depname>
    <tenant>dave-9000</tenant>
    <tenant_id>7e55d1c5cd08443a81d6a1c690562948</tenant_id>
    <depid>d7f81258-8f52-4147-891e-a4e1c849039b</depid>
    <vm_group>new-group-name-2</vm_group>
    <vm_source>
      <vmid>9cc7987c-1825-4e57-b5d3-603b1ddb5a0a</vmid>
      <vmname>new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-91b3-1fc1187e6d0f</vmname>
      <generated_vmname>new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-91b3-
1fc1187e6d0f</generated_vmname>
      <vim_id>default_openstack_vim</vim_id>
      <vim_project>dave-9000</vim_project>
      <vim_project_id>7e55d1c5cd08443a81d6a1c690562948</vim_project_id>
      <hostid>0a6b80f1791cec6abfceadd38aabf555df3d66b2acd9a01d15f03c1c</hostid>
      <hostname>pf-ucs-27</hostname>
```

```xml
        </vm_source>
      <event>
        <type>VM_BACKUP_INIT</type>
      </event>
    </escEvent>
</notification>


<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2021-10-18T20:25:36.596+00:00</eventTime>
  <escEvent xmlns=http://www.cisco.com/esc/esc>
    <status>SUCCESS</status>
    <status_code>202</status_code>
    <status_message>VM snapshot pending [new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-
91b3-1fc1187e6d0f] with the image [ae976968-4e9a-4fd8-8bf2-
46fc25869e23].</status_message>
    <depname>new-deployment-name2</depname>
    <tenant>dave-9000</tenant>
    <tenant_id>7e55d1c5cd08443a81d6a1c690562948</tenant_id>
    <depid>d7f81258-8f52-4147-891e-a4e1c849039b</depid>
    <vm_group>new-group-name-2</vm_group>
    <vm_source>
      <vmid>9cc7987c-1825-4e57-b5d3-603b1ddb5a0a</vmid>
      <vmname>new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-91b3-1fc1187e6d0f</vmname>
      <generated_vmname>new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-91b3-
1fc1187e6d0f</generated_vmname>
      <vim_id>default_openstack_vim</vim_id>
      <vim_project>dave-9000</vim_project>
      <vim_project_id>7e55d1c5cd08443a81d6a1c690562948</vim_project_id>
      <hostid>0a6b80f1791cec6abfceadd38aabf555df3d66b2acd9a01d15f03c1c</hostid>
      <hostname>pf-ucs-27</hostname>
    </vm_source>
    <event>
      <type>VM_BACKUP_CREATED</type>
    </event>
  </escEvent>
</notification>

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2021-10-18T20:25:53.602+00:00</eventTime>
  <escEvent xmlns=http://www.cisco.com/esc/esc>
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Snapshot image [daves-confd-backup] for VM [new-deployment-n_new-
gr_0_fd22be9e-dedf-4f7b-91b3-1fc1187e6d0f] is active.</status_message>
    <depname>new-deployment-name2</depname>
    <tenant>dave-9000</tenant>
    <tenant_id>7e55d1c5cd08443a81d6a1c690562948</tenant_id>
    <depid>d7f81258-8f52-4147-891e-a4e1c849039b</depid>
    <vm_group>new-group-name-2</vm_group>
    <vm_source>
      <vmid>9cc7987c-1825-4e57-b5d3-603b1ddb5a0a</vmid>
      <vmname>new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-91b3-1fc1187e6d0f</vmname>
      <generated_vmname>new-deployment-n_new-gr_0_fd22be9e-dedf-4f7b-91b3-
1fc1187e6d0f</generated_vmname>
      <vim_id>default_openstack_vim</vim_id>
      <vim_project>dave-9000</vim_project>
      <vim_project_id>7e55d1c5cd08443a81d6a1c690562948</vim_project_id>
      <hostid>0a6b80f1791cec6abfceadd38aabf555df3d66b2acd9a01d15f03c1c</hostid>
      <hostname>pf-ucs-27</hostname>
    </vm_source>
    <event>
```

```
        <type>VM_BACKUP_COMPLETE</type>
    </event>
  </escEvent>
</notification>
```

On Failure:

Event notification

An escEvent will still be generated given one of the above notifications, with the status code and message set appropriately.

Handling Activation Failures
If a **failure** occurs while creating a snapshot, the client will have the option of trying again once the failure situation is unblocked.

6.1.36 List Snapshot
It is possible to list all ESC created and managed snapshots using the ESC REST API only.
No Netconf notifications are generated by this operation.

6.1.37 Delete Snapshot
It is possible to use the REST API to delete a snapshot of an ESC managed VM. This deletes both the snapshot image on OpenStack, and the bootable volume snapshot if the ESC managed VM contained a bootable volume.

6.1.37.1 Netconf Request
There is no Netconf CLI available for deleting a snapshot, only a REST API.
The REST API still generates Netconf notifications though, along with notifications to the ESC callback URLs.

6.1.37.2 Netconf Response
Not applicable

6.1.37.3 Snapshot Deletion / Configuration Activation:
On Success:

Event notification
Two escEvents with a status of **SUCCESS** will be sent to Netconf subscribers once the snapshot has deleted.

The notifications are:

Notification	When the notification is sent
VM_SNAPSHOT_DELETING	When the API is invoked, and validation passed.

Notification	When the notification is sent
VM_SNAPSHOT_DELETED	When OpenStack has finished the snapshot delete operation, and it was either a success, or an error occurred.

Shown below are examples of the two notifications:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
    <eventTime>2021-09-14T12:18:39.836+00:00</eventTime>
    <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Snapshot image [2ffadd36-3b41-4c13-a9d6-a48c07764d1a] is being
deleted.</status_message>
    <depname>snapshot-deployment-name</depname>
    <tenant>snapshot-tenant</tenant>
    <tenant_id>7d61b5de73874f88a458d486759a9b83</tenant_id>
    <depid>ae0bea05-9630-4d17-a9e7-926f1f625dc7</depid>
    <vm_group>snapshot-group</vm_group>
    <vm_source>
        <vmid>1773914c-20cd-4f50-b337-1e46be2cf295</vmid>
        <vmname>new-deployment-n_new-gr_0_af0148e2-e74c-4be7-b8c1-
49bd53def6ba</vmname>
        <generated_vmname>new-deployment-n_new-gr_0_af0148e2-e74c-4be7-b8c1-
49bd53def6ba</generated_vmname>
        <vim_id>default_openstack_vim</vim_id>
        <vim_project>snapshot-tenant</vim_project>
        <vim_project_id>7d61b5de73874f88a458d486759a9b83</vim_project_id>
        <hostid>95503baadeccce2d33e5d924322390aee9d30c6ed24043284bf46984</hostid>
        <hostname>pf-ucs-27</hostname>
    </vm_source>
    <event>
        <type>VM_SNAPSHOT_DELETING</type>
    </event>
    </escEvent>
</notification>


<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
    <eventTime>2021-09-14T12:18:39.836+00:00</eventTime>
    <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Snapshot image [2ffadd36-3b41-4c13-a9d6-a48c07764d1a] has been
deleted.</status_message>
    <depname>snapshot-deployment-name</depname>
    <tenant>snapshot-tenant</tenant>
    <tenant_id>7d61b5de73874f88a458d486759a9b83</tenant_id>
    <depid>ae0bea05-9630-4d17-a9e7-926f1f625dc7</depid>
    <vm_group>snapshot-group</vm_group>
    <vm_source>
        <vmid>1773914c-20cd-4f50-b337-1e46be2cf295</vmid>
        <vmname>new-deployment-n_new-gr_0_af0148e2-e74c-4be7-b8c1-
49bd53def6ba</vmname>
        <generated_vmname>new-deployment-n_new-gr_0_af0148e2-e74c-4be7-b8c1-
49bd53def6ba</generated_vmname>
        <vim_id>default_openstack_vim</vim_id>
        <vim_project>snapshot-tenant</vim_project>
```

```
            <vim_project_id>7d61b5de73874f88a458d486759a9b83</vim_project_id>
            <hostid>95503baadeccce2d33e5d924322390aee9d30c6ed24043284bf46984</hostid>
            <hostname>pf-ucs-27</hostname>
    </vm_source>
    <event>
            <type>VM_SNAPSHOT_DELETED</type>
    </event>
    </escEvent>
</notification>
```

On Failure:
Event notification

An escEvent will still be generated given one of the above notifications, with the status code and message set appropriately.

Handling Activation Failures
If a **failure** occurs while deleting a snapshot, the snapshot will still be deleted within ESC, and the client will have to manually delete VIM resources if required.

6.1.38 Create Volume from Volume Snapshot
It is possible to use the REST API to create a bootable volume from a snapshot volume, previously created from an ESC API.

6.1.38.1 Netconf Request
There is no Netconf CLI available for creating a volume from a snapshot volume, only a REST API.
The REST API **does not** generate Netconf notifications though, only notifications to the ESC callback URLs.

6.1.38.2 Netconf Response
Not applicable

6.1.38.3 Configuration ActivationCreate Volume from Volume Snapshot
On Success:
On Failure:
No Netconf notifications are currently sent.

6.1.39 Create Trunk

Submit the deployment XML using either REST or Netconf interface. The trunk is created just before ESC deploys the VM. A netconf message will be posted for each trunk created:

6.1.39.1 Deployment xml file format for Create Trunk

```
<vm_group>
    <name>...</name>
    <image>...</image>
    <flavor>...</flavor>
    <interfaces>
        <interface>
```

```
            <nicid>0</nicid>
            <network>parent-net</network>
        </interface>
    </interfaces>
    <trunks>
        <trunk>
            <name>trunk-name</name>
            <parent_nicid>0</parent_nicid>
            <subports>
                <subport>
                    <name>child-port</name>
                    <network>child-net</network>
                    <segmentation_type>vlan</segmentation_type>
                    <segmentation_id>500</segmentation_id>
                </subport>
            </subports>
        </trunk>
    </trunks>
</vm_group>
```

6.1.39.2 Configuration Activation

On Success:

Event notification

Three escEvents with a status of **SUCCESS** will be sent to Netconf subscribers once the trunk is created.

The notifications are:

Notification	When the notification is sent
CREATE_TRUNK	After creating truck successfully

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2022-06-08T13:39:14.609+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Trunk trunk-D120-vm1: CREATE_TRUNK completed
successfully</status_message>
    <event>
      <type>CREATE_TRUNK</type>
    </event>
  </escEvent>
</notification>
```

6.1.40 Create SecurityGroup
6.1.40.1 Netconf Request
```
            <esc_datamodel xmlns="http://www.cisco.com/esc/esc">
                <tenants>
                    <tenant>
                        <name>admin</name>
                        <security_groups>
                            <security_group>
                                <name>SecurityGroupName</name>
                                <description>Newly created SG</description>
                                <security_rules>
                                    <security_rule>
                                        <name>mygrpRule1</name>
```

```
                                    <direction>ingress</direction>
                                    <ip_protocol>tcp</ip_protocol>
                                    <port_range>22:22</port_range>
                                    <ether_type>IPv4</ether_type>
                                <remote_ip_prefix>::/0</remote_ip_prefix>
                                     <security_rule>
                            </security_rules>
                            </security_group>
                        </security_groups>
                    </tenant>
                </tenants>
        </esc_datamodel>
```

6.1.40.2 Netconf Response

An rpc-reply response is returned with a status of ok if the request was accepted for activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details

6.1.40.3 Configuration Activation

NETCONF notification upon successful creation of a security group:

==== SEND NOTIFICATION STARTS =====

INFO Type: CREATE_SECURITYGROUP

INFO Status: SUCCESS

INFO Status Code: 200

INFO Status Msg: Security group successfully created.

INFO Tenant: admin

INFO SecurityGroup: SecurityGroupName

INFO ===== SEND NOTIFICATION ENDS =====

Note   When a user creates a security group in OpenStack, OpenStack automatically adds two IP filter rules to the group. ESC does not manage rules that were created automatically by OpenStack. As a result, it deliberately deletes the auto-created default rules and only adds user-created rules from the deployment request.

6.1.41 Update SecurityGroup
6.1.41.1 Netconf Request

To add the new rule, add the rule details into the existing Security group as highlighted: -

```
<esc_datamodel xmlns="http://www.cisco.com/esc/esc"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0"
xmlns:ns0="urn:ietf:params:xml:ns:netconf:notification:1.0">
    <tenants>
        <tenant>
            <name>admin</name>
            <security_groups>
                <security_group>
                    <name>sgexp01</name>
                    <security_rules>
                        <security_rule>
                            <name>rule1</name>
                                <direction>ingress</direction>
                                <ip_protocol>tcp</ip_protocol>
                                <port_range>11:11</port_range>
                                <ether_type>IPv4</ether_type>
                        </security_rule>
                        <security_rule>
                            <name>rule2</name>
                                <direction>egress</direction>
                                <ip_protocol>tcp</ip_protocol>
                                <ether_type>IPv4</ether_type>
                        </security_rule>
                    </security_rules>
```

```
                    </security_group>
                  </security_groups>
                </tenant>
              </tenants>
          </esc_datamode>
```

To delete the existing rule under a Security Group, submit the following request:

```
<esc_datamodel xmlns="http://www.cisco.com/esc/esc"
        xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0"
        xmlns:ns0="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <tenants>
   <tenant>
    <name>admin</name>
    <security_groups>
     <security_group>
      <name>sgexp01</name>
      <description>sthandap created sg1</description>
         <security_rules>

         <security_rule nc:operation='delete'>
          <name>rule1</name>
         </security_rule>
          <security_rule>
           <name>rule2</name>
           <direction>ingress</direction>
           <ip_protocol>tcp</ip_protocol>
           <port_range>11:11</port_range>
           <ether_type>IPv4</ether_type>
          </security_rule>

         </security_rules>
       </security_group>
      </security_groups>
     </tenant>
    </tenants>
  </esc_datamode>
```

Note : If Security Group is attached to a VNF then, Deletion of a Security Group is not possible.

6.1.41.2 Netconf Response

An rpc-reply response is returned with a status of ok if the request was accepted for activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details

6.1.41.3 Configuration Activation

NETCONF notification upon successful update of a security group:

===== SEND NOTIFICATION STARTS =====

Type: UPDATE_SECURITYGROUP

Status: SUCCESS

Status Code: 200

Status Msg: SecurityGroup successfully updated.

INFO Tenant: admin

INFO SecurityGroup: sgexp01

INFO ===== SEND NOTIFICATION ENDS =====

6.1.42 Delete SecurityGroup

6.1.42.1 Netconf Request

```
<?xml version='1.0' encoding='ASCII'?>
<esc_datamodel xmlns="http://www.cisco.com/esc/esc">
    <tenants>
```

```
            <tenant>
                <name>admin</name>
                <security_groups>
                    <security_group nc:operation="delete"> <name>SecurityGroupName</name>
                    </security_group>
                </security_groups>
            </tenant>
        </tenants>
    </esc_datamodel>
```

6.1.42.2 Netconf Response

An rpc-reply response is returned with a status of ok if the request was accepted for activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details

6.1.42.3 Configuration Activation

NETCONF notification upon successful deletion of a security group:

<Place holder to provide NETCONF notification on successful deletion of a security group> INFO ===== SEND NOTIFICATION STARTS =====

INFO Type: DELETE_SECURITYGROUP

INFO Status: SUCCESS

INFO Status Code: 200

INFO Status Msg: Security Group successfully deleted.

INFO Tenant: admin

INFO SecurityGroup: SecurityGroupName

6.1.43 Associate or Dis-associate a Security Group from a VNF

6.1.43.1 Netconf Request

NETCONF request to associate or dis-associate a security group from a VNF interface:

Users can associate the security group to a VNF while deploying it under interface section as follows :-

```
<esc_datamodel xmlns="http://www.cisco.com/esc/esc"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0"
xmlns:ns0="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <tenants>
  <tenant>
   <name>admin</name>
   <deployments>
    <deployment>
          -------------
    <interfaces>
    <interface>
    <nicid>0</nicid>
    <network>esc-net</network>
    <security_groups> <security_group>sg-dep-2</security_group>
     </security_groups>
     </interface>
        </interfaces>
            -----------
    </deployment>
   </deployments>
  </tenant>
 </tenants>
</esc_datamodel>
```

The following example shows how to disassociate the security group from VNF

```
<esc_datamodel xmlns="http://www.cisco.com/esc/esc"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0"
xmlns:ns0="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <tenants>
  <tenant>
   <name>admin</name>
```

```
        <deployments>
         <deployment>
                 -------------
         <interfaces>
         <interface>
         <nicid>0</nicid>
         <network>esc-net</network>
         <security_groups>
                 <security_group nc:operation='delete'>sg-dep-2</security_group>
        <security_group>sg-dep-2</security_group>

           </security_groups>
           </interface>
              </interfaces>
                 -----------
           </deployment>
          </deployments>
         </tenant>
        </tenants>
       </esc_datamodel>
```

6.1.43.2 Netconf Response

An rpc-reply response is returned with a status of ok if the request was accepted for activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details

6.1.43.3 Configuration Activation

NETCONF notification upon successful associate of a security group:

INFO ===== SEND NOTIFICATION STARTS =====

INFO Type: SERVICE_ALIVE

INFO Status: SUCCESS

INFO Status Code: 200

INFO Status Msg: Service group deployment completed successfully!

INFO Tenant: admin

INFO Deployment ID: 4438ca1b-4635-4384-8cad-33c647b10853

INFO Deployment name: test1-dep-5

INFO ===== SEND NOTIFICATION ENDS =====

NETCONF notification upon successful disassociation of a security group:

INFO ===== SEND NOTIFICATION STARTS =====

INFO Type: SVC_SET_MONITOR_STATUS

INFO Status: SUCCESS

INFO Status Code: 200

INFO Status Msg: Service monitor setting completed successfully.

INFO Tenant: admin

INFO Deployment ID: 711bb189-82ea-46a6-b32d-1561af35eaf3

INFO Deployment name: test1-dep-4

INFO ===== SEND NOTIFICATION ENDS =====

The following table lists the security group deployment attributes:

	Security Group	
name	string	Name of the security group to be created
security_rules	Container	Security rules to be attached to the security group
security_rule		
name	types:escsecuritygroupname	Security Group Rule's name
direction	types:escsecuritygroupruleparameter	egress / ingress
ether_type	types:escsecuritygroupruleparameter	IPv6 / IPv4
ip_protocol	types:escsecuritygroupruleparameter	ICMP/TCP/ UDP/any
port_range	types:escsecuritygroupruleparameter	Port range of security group rule
remote_ip_prefix	types:escsecuritygroupruleparameter	Remote IP prefix of Security Group rule
remote_security_group	types:escsecuritygroupruleparameter	Remote security group of Security Group Rule

6.2 Operational Workflows

There are 5 operations that can be done to the entire service/deployment or individual deployed VMs.

- STOP
- START

- REBOOT
- DISABLE_MONITOR
- ENABLE_MONITOR
- RECOVER

6.2.1 Service Operations

6.2.1.1 Stop Service

6.2.1.1.1 Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <serviceAction xmlns="http://www.cisco.com/esc/esc">
        <actionType>STOP</actionType>
        <tenantName>sampleTenant</tenantName>
        <depName>sampleDep </depName>
      </serviceAction>
    </config>
  </edit-config>
</rpc>
```

6.2.1.1.2 Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.1.1.3 Event Notifications

All VMs are stopped first. Each one succeeds with a notification:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.262+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM successfully stopped</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>VM_STOPPED</type>
    </event>
  </escEvent>
</notification>
```

When all VMs have been stopped, there is a final notification:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
```

```
        <status_message>Service group suspension completed
successfully</status_message>
        <depname>dep</depname>
        <tenant>hezh-yesc-0520</tenant>
        <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
        <vm_source>
     </vm_source>
        <vm_target>
     </vm_target>
        <event>
           <type>SERVICE_STOPPED</type>
        </event>
     </escEvent>
  </notification>
```

If there are errors during stopping the service, there will be a final notification indicating the error:
```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
         <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
         <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>FAILURE</status>
            <status_message>Service group suspension failed</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_source>
         </vm_source>
            <vm_target>
         </vm_target>
            <event>
               <type>SERVICE_STOPPED</type>
            </event>
         </escEvent>
      </notification>
```

6.2.1.2 Start Service

6.2.1.2.1   Netconf Request
```
        <rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
         <edit-config>
           <target>
              <running/>
           </target>
           <config>
              <serviceAction xmlns="http://www.cisco.com/esc/esc">
                 <actionType>START</actionType>
                 <tenantName>sampleTenant</tenantName>
                 <depName>sampleDep </depName>
              </serviceAction>
           </config>
         </edit-config>
        </rpc>
```

6.2.1.2.2   Netconf Response
An ***rpc-reply*** response is returned with a status of ***ok*** if the request was accepted for activation, or a status of ***rpc-error*** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.1.2.3   Event Notifications
All VMs are started first. Each one succeeds with a notification:
```
        <?xml version="1.0" encoding="UTF-8"?>
```

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.262+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM successfully started</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>VM_STARTED</type>
    </event>
  </escEvent>
</notification>
```

When a VM has been started, it will be monitored using ICMP ping. When it gets alive, ESC will send the notification indicating VM is alive:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM_Alive event received after started, VM ID:
[CIRROS_HEZH__614__hezh-yesc-0520__hezh-yesc-
0520depCIRROS_HEZH1.6__0__CSR__0]</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>VM_ALIVE</type>
    </event>
  </escEvent>
</notification>
```

When all VMs are alive, there is a final notification:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.487+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Service group started successfully</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_source>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>SERVICE_ALIVE</type>
    </event>
  </escEvent>
</notification>
```

If there are errors during starting the service, there will be a final notification indicating the error:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
```

```
            <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
            <escEvent xmlns="http://www.cisco.com/esc/esc">
              <status>FAILURE</status>
              <status_message>Service group start failed</status_message>
              <depname>dep</depname>
              <tenant>hezh-yesc-0520</tenant>
              <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
              <vm_source>
            </vm_source>
              <vm_target>
            </vm_target>
              <event>
                 <type>SERVICE_ALIVE</type>
              </event>
            </escEvent>
         </notification>
```

6.2.1.3 Reboot Service

6.2.1.3.1   Netconf Request

```
         <rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
            <edit-config>
              <target>
                <running/>
              </target>
              <config>
                <serviceAction xmlns="http://www.cisco.com/esc/esc">
                   <actionType>REBOOT</actionType>
                   <tenantName>sampleTenant</tenantName>
                   <depName>sampleDep </depName>
                </serviceAction>
              </config>
            </edit-config>
         </rpc>
```

6.2.1.3.2   Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.1.3.3   Event Notifications

All VMs are rebooted first. Each one succeeds with a notification:
```
         <?xml version="1.0" encoding="UTF-8"?>
         <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
            <eventTime>2015-05-19T21:21:00.262+00:00</eventTime>
            <escEvent xmlns="http://www.cisco.com/esc/esc">
              <status>SUCCESS</status>
              <status_message>VM successfully rebooted</status_message>
              <depname>dep</depname>
              <tenant>hezh-yesc-0520</tenant>
              <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
              <vm_group>CSR</vm_group>
              <vm_source>
                <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
                <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
            </vm_source>
              <vm_target>
            </vm_target>
              <event>
                 <type>VM_REBOOTED</type>
              </event>
            </escEvent>
```

```
        </notification>
```

When a VM has been rebooted, it will be monitored using ICMP ping. When it gets alive, ESC will send
the notification indicating VM is alive:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
            <status_message>VM_Alive event received after rebooted, VM ID:
        [CIRROS_HEZH__614__hezh-yesc-0520__hezh-yesc-
        0520depCIRROS_HEZH1.6_0__CSR_0]</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_group>CSR</vm_group>
            <vm_source>
              <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
              <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
            </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>VM_ALIVE</type>
            </event>
          </escEvent>
        </notification>
```

When all VMs are alive, there is a final notification:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T23:46:36.487+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
            <status_message>Service group rebooted successfully</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_source>
          </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>SERVICE_ALIVE</type>
            </event>
          </escEvent>
        </notification>
```

If there are errors during rebooting the service, there will be a final notification indicating the error:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>FAILURE</status>
            <status_message>Service group reboot failed</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_source>
          </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>SERVICE_ALIVE</type>
            </event>
          </escEvent>
        </notification>
```

6.2.1.4 Disable Service Monitor

6.2.1.4.1   Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <serviceAction xmlns="http://www.cisco.com/esc/esc">
        <actionType>DISABLE_MONITOR</actionType>
        <tenantName>sampleTenant</tenantName>
        <depName>sampleDep </depName>
      </serviceAction>
    </config>
  </edit-config>
</rpc>
```

6.2.1.4.2   Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.1.4.3   Event Notifications

Disabling monitor for each VM succeeds with a notification:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.262+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Unset Monitoring VM successfully.</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>VM_MONITOR_UNSET</type>
    </event>
  </escEvent>
</notification>
```

When all VMs have done unsseting monitors, there is a final notification:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Service group suspension completed
successfully</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_source>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
```

```
            <type>SERVICE_MONITOR_UNSET</type>
        </event>
      </escEvent>
    </notification>
```

If there are errors during disabling the monitors of the service, there will be a final notification indicating the error:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>FAILURE</status>
            <status_message>Service group disable monitor failed</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_source>
          </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>SERVICE_MONITOR_UNSET</type>
            </event>
          </escEvent>
        </notification>
```

6.2.1.5 Enable Service Monitor

```
        <rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
          <edit-config>
            <target>
              <running/>
            </target>
            <config>
              <serviceAction xmlns="http://www.cisco.com/esc/esc">
                <actionType>ENABLE_MONITOR</actionType>
                <tenantName>sampleTenant</tenantName>
                <depName>sampleDep </depName>
              </serviceAction>
            </config>
          </edit-config>
        </rpc>
```

6.2.1.5.1   Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.1.5.2   Event Notifications

All VMs have their monitors first. When one VM gets alive, ESC will send the notification indicating VM is alive:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
            <status_message>VM_Alive event received, VM ID: [CIRROS_HEZH__614__hezh-
        yesc-0520__hezh-yesc-0520depCIRROS_HEZH1.6__0__CSR_0]</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_group>CSR</vm_group>
```

```
        <vm_source>
            <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
            <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
        </vm_source>
        <vm_target>
      </vm_target>
        <event>
            <type>VM_ALIVE</type>
        </event>
      </escEvent>
    </notification>
```

When all VMs are alive, there is a final notification:
```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T23:46:36.487+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
            <status_message>Service group set monitor successfully</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_source>
          </vm_source>
            <vm_target>
          </vm_target>
            <event>
                <type>SERVICE_ALIVE</type>
            </event>
          </escEvent>
        </notification>
```
If there are errors during setting the monitor to the service, there will be a final notification indicating
the error:
```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>FAILURE</status>
            <status_message>Service group set monitor failed</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_source>
          </vm_source>
            <vm_target>
          </vm_target>
            <event>
                <type>SERVICE_ALIVE</type>
            </event>
          </escEvent>
        </notification>
```

6.2.1.6 RECOVER SERVICE

In ESC 4.1 and later, two action types are added to the Service Level Recovery. The actionType
can be RECOVER or SET_MONITOR_AND_RECOVER. In case of RECOVER action type, ESC will
immediately start the recovery workflow. In case of SET_MONITOR_AND_RECOVER action
type, ESC will start the monitor and check if VM become alive/active. If VM becomes alive or
active, then ESC will cancel the recovery workflow. If VM is not alive, then ESC will start the
recovery workflow.

Service level recovery request can be configured to override the predefined recovery action to
any desired action.
```
        <rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
          <edit-config>
            <target>
              <running/>
```

```
        </target>
        <config>
          <serviceAction xmlns="http://www.cisco.com/esc/esc">
            <actionType>RECOVER</actionType>
            <tenantName>sampleTenant</tenantName>
            <depName>sampleDep </depName>
            <properties>
              <property>
                <name>action</name>
                <value>REDEPLOY_ONLY</value>
              </property>
            </properties>
          </serviceAction>
        </config>
      </edit-config>
    </rpc>
```

6.2.1.6.1   Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.1.6.2   Event Notifications

All error VMs go to the recovery. For the recovery of each VM, the notification is shown as follows.

VM_RECOVERY_INIT:
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-12T06:32:57.166+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Recovery event for VM [jenkins-InfQueTt_InfQue_0_b65c8381-138e-4601-96e0-
a3662ca8fd9a] triggered.</status_message>
    <depname>jenkins-InfQueTtrecovery-527433</depname>
    <tenant>jenkins-Intfwithrecovery-527433</tenant>
    <tenant_id>642481a5d0674d239ec7f5cc226ab9c3</tenant_id>
    <svcid>NULL</svcid>
    <depid>d404baad-35ce-4893-9d89-4d7c2dcfd9b3</depid>
    <vm_group>InfQueRecoveryGrp1</vm_group>
    <vm_source>
      <vmid>6fd994c3-868a-4303-8b66-505e6209ff59</vmid>
      <hostid>d86db58f206828fa45ec824bce32e84ee242f36617c52d7038492a57</hostid>
      <hostname>my-ucs-46</hostname>
    </vm_source>
    <event>
      <type>VM_RECOVERY_INIT</type>
    </event>
  </escEvent>
</notification>
```
VM_RECOVERY_REBOOT:

Failure:
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-12T06:45:19.465+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>FAILURE</status>
    <status_code>500</status_code>
    <status_message>VM [jenkins-InfQueTt_InfQue_0_ff684938-3ecd-4832-b3ae-
977e469dd495] failed to be rebooted.</status_message>
    <depname>jenkins-InfQueTtrecovery-527433</depname>
    <tenant>jenkins-Intfwithrecovery-527433</tenant>
    <tenant_id>a69061e521f84c5aa0b5f3205d6b6143</tenant_id>
    <svcid>NULL</svcid>
    <depid>3d01e189-6cbf-49f2-bca9-ef948682ab8b</depid>
    <vm_group>InfQueRecoveryGrp1</vm_group>
```

```
      <vm_source>
        <vmid>63c6f98a-3922-418c-b26b-e658184eb998</vmid>
        <hostid>48bc1170ba84aac66f30a14ce4306e057dc83d90c1ea6e175a765475</hostid>
        <hostname>my-ucs-46</hostname>
      </vm_source>
      <event>
        <type>VM_RECOVERY_REBOOT</type>
      </event>
    </escEvent>
</notification>
```

Success:
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-12T06:33:14.363+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>VM [jenkins-InfQueTt_InfQue_0_b65c8381-138e-4601-96e0-a3662ca8fd9a] is
rebooted.</status_message>
   <depname>jenkins-InfQueTtrecovery-527433</depname>
   <tenant>jenkins-Intfwithrecovery-527433</tenant>
   <tenant_id>642481a5d0674d239ec7f5cc226ab9c3</tenant_id>
   <svcid>NULL</svcid>
   <depid>d404baad-35ce-4893-9d89-4d7c2dcfd9b3</depid>
   <vm_group>InfQueRecoveryGrp1</vm_group>
   <vm_source>
     <vmid>6fd994c3-868a-4303-8b66-505e6209ff59</vmid>
     <hostid>d86db58f206828fa45ec824bce32e84ee242f36617c52d7038492a57</hostid>
     <hostname>my-ucs-46</hostname>
   </vm_source>
   <event>
     <type>VM_RECOVERY_REBOOT</type>
   </event>
  </escEvent>
</notification>
```

VM_RECOVERY_UNDEPLOYED: (If recovery reboot failed, the recovery redeploy is performed and this
notification will be sent.)
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-13T14:10:36.415+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>204</status_code>
   <status_message>VM [jenkins-service-_2-GROU_0_7759b8f8-0d99-44cd-bd08-b8ddee44928e] has
been undeployed.</status_message>
   <depname>jenkins-service-recovery-dep-408920</depname>
   <tenant>jenkins-service-recovery-tenant-408920</tenant>
   <tenant_id>218899cd681f4195946bc51b6708d242</tenant_id>
   <svcid>NULL</svcid>
   <depid>c616dc4f-ac93-4481-a15a-fc39187faf40</depid>
   <vm_group>2-GROUP</vm_group>
```

```
    <vm_source/>
    <event>
     <type>VM_RECOVERY_UNDEPLOYED</type>
    </event>
   </escEvent>
</notification>
VM_RECOVERY_DEPLOYED:
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-13T14:10:57.733+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>VM [jenkins-service-_1-GROU_0_b2cb30bc-30f7-49f8-99af-ee35b54c848d] has
been deployed as part of recovery.</status_message>
   <depname>jenkins-service-recovery-dep-408920</depname>
   <tenant>jenkins-service-recovery-tenant-408920</tenant>
   <tenant_id>218899cd681f4195946bc51b6708d242</tenant_id>
   <svcid>NULL</svcid>
   <depid>c616dc4f-ac93-4481-a15a-fc39187faf40</depid>
   <vm_group>1-GROUP</vm_group>
   <vm_source>
    <vmid>6fdfff78-895e-47db-a7e0-56bd5c4a157b</vmid>
    <hostid>3ae88406fbb5ece2f38963d00ec4463ea66ecf5026d33900a462153d</hostid>
    <hostname>my-ucs-46</hostname>
   </vm_source>
   <vm_target>
    <vmid>a57645ed-add6-4452-8424-83f4fcacf2df</vmid>
    <hostid>1231b3fe55fdd33d4d2d358fc000c2d6a47110b34266526c7a1f521e</hostid>
    <hostname>my-ucs-47</hostname>
    <interfaces>
     <interface>
      <nicid>0</nicid>
      <type>virtual</type>
      <port_id>26636048-a57e-4be0-ba38-2227f30eae14</port_id>
      <network>9f7fd81d-577a-4d1e-bba7-84be3a1073d3</network>
      <subnet>70172be9-f1f3-4803-b49a-22eb1bae72e1</subnet>
      <ip_address>172.16.0.230</ip_address>
      <mac_address>fa:16:3e:c9:e6:9b</mac_address>
      <netmask>255.255.240.0</netmask>
      <gateway>172.16.0.1</gateway>
     </interface>
    </interfaces>
   </vm_target>
   <event>
    <type>VM_RECOVERY_DEPLOYED</type>
   </event>
  </escEvent>
</notification>
```

VM_RECOVERY_COMPLETE:

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2017-04-13T14:11:20.076+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>Recovery: Successfully recovered VM [jenkins-service-_1-GROU_0_b2cb30bc-30f7-
49f8-99af-ee35b54c848d].</status_message>
   <depname>jenkins-service-recovery-dep-408920</depname>
   <tenant>jenkins-service-recovery-tenant-408920</tenant>
   <tenant_id>218899cd681f4195946bc51b6708d242</tenant_id>
   <svcid>NULL</svcid>
   <depid>c616dc4f-ac93-4481-a15a-fc39187faf40</depid>
   <vm_group>1-GROUP</vm_group>
   <vm_source>
    <vmid>6fdfff78-895e-47db-a7e0-56bd5c4a157b</vmid>
    <hostid>3ae88406fbb5ece2f38963d00ec4463ea66ecf5026d33900a462153d</hostid>
    <hostname>my-ucs-46</hostname>
   </vm_source>
   <vm_target>
    <vmid>a57645ed-add6-4452-8424-83f4fcacf2df</vmid>
    <hostid>1231b3fe55fdd33d4d2d358fc000c2d6a47110b34266526c7a1f521e</hostid>
    <hostname>my-ucs-47</hostname>
    <interfaces>
     <interface>
      <nicid>0</nicid>
      <type>virtual</type>
      <port_id>26636048-a57e-4be0-ba38-2227f30eae14</port_id>
      <network>9f7fd81d-577a-4d1e-bba7-84be3a1073d3</network>
      <subnet>70172be9-f1f3-4803-b49a-22eb1bae72e1</subnet>
      <ip_address>172.16.0.230</ip_address>
      <mac_address>fa:16:3e:c9:e6:9b</mac_address>
      <netmask>255.255.240.0</netmask>
      <gateway>172.16.0.1</gateway>
     </interface>
    </interfaces>
   </vm_target>
   <event>
    <type>VM_RECOVERY_COMPLETE</type>
   </event>
  </escEvent>
</notification>
```

6.2.2 VM operations

6.2.2.1 Stop VM

6.2.2.1.1 Netconf Request
```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
      <running/>
    </target>
    <config>
      <vmAction xmlns="http://www.cisco.com/esc/esc">
        <actionType>STOP</actionType>
        <vmName>sampleVmName</vmName>
        <force>true/false</force>
      </vmAction>
    </config>
  </edit-config>
</rpc>
```

The "force" option in the request decides if ESC considers the min_vm requirement for the service. Since stopping a VM would affect the service availability, after the VM is stopped the min_vm requirement specified in the datamodel may not be satisfied. If the "force" option is true, ESC will ignore the requirement for min_vm.

6.2.2.1.2 Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details.

6.2.2.1.3 Event Notifications

When the VM is successfully stopped, ESC will send a notification:
```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.262+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM successfully stopped</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <svcid>NULL</svcid>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>VM_STOPPED</type>
    </event>
  </escEvent>
</notification>
```

If there are errors during stopping the VM, there will be a final notification indicating the error:
```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
```

```
        <escEvent xmlns="http://www.cisco.com/esc/esc">
         <status>FAILURE</status>
         <status_message>Service group suspension failed</status_message>
         <depname>dep</depname>
         <tenant>hezh-yesc-0520</tenant>
         <svcid>NULL</svcid>
         <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
         <vm_source>
        </vm_source>
         <vm_target>
        </vm_target>
         <event>
            <type>VM_STOPPED</type>
         </event>
        </escEvent>
      </notification>
```

6.2.2.2 Start VM

6.2.2.2.1   Netconf Request
```
        <rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
         <edit-config>
          <target>
            <running/>
          </target>
          <config>
            <vmAction xmlns="http://www.cisco.com/esc/esc">
             <actionType>START</actionType>
             <vmName>sampleVmName</vmName>
             <force>false</force>
            </vmAction>
          </config>
         </edit-config>
        </rpc>
```

6.2.2.2.2   Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.2.2.3   Event Notifications

When the VM is successfully started, ESC will send a notification:
```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
         <eventTime>2015-05-19T21:21:00.262+00:00</eventTime>
         <escEvent xmlns="http://www.cisco.com/esc/esc">
          <status>SUCCESS</status>
          <status_message>VM successfully started</status_message>
          <depname>dep</depname>
          <tenant>hezh-yesc-0520</tenant>
          <svcid>NULL</svcid>
          <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
          <vm_group>CSR</vm_group>
          <vm_source>
            <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
            <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
          </vm_source>
          <vm_target>
         </vm_target>
          <event>
            <type>VM_STARTED</type>
          </event>
         </escEvent>
```

```
        </notification>
```

When the VM has been started, it will be monitored using ICMP ping. When it gets alive, ESC will send
the notification indicating VM is alive:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
            <status_message>VM_Alive event received after started, VM ID:
        [CIRROS_HEZH__614__hezh-yesc-0520__hezh-yesc-
        0520depCIRROS_HEZH1.6_0_CSR_0]</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <svcid>NULL</svcid>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_group>CSR</vm_group>
            <vm_source>
              <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
              <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
            </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>VM_ALIVE</type>
            </event>
          </escEvent>
        </notification>
```

If there are errors during starting the VM, there will be a final notification indicating the error:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>FAILURE</status>
            <status_message>VM start failed</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <svcid>NULL</svcid>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_source>
          </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>VM_STARTED</type>
            </event>
          </escEvent>
        </notification>
```

6.2.2.3 Reboot VM

6.2.2.3.1   Netconf Request

```
        <rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
          <edit-config>
            <target>
              <running/>
            </target>
            <config>
              <vmAction xmlns="http://www.cisco.com/esc/esc">
                <actionType>REBOOT</actionType>
                <vmName>sampleVmName</vmName>
                <force>true/false</force>
              </vmAction>
            </config>
          </edit-config>
```

```
    </rpc>
```

The "force" option in the request decides if ESC considers the min_vm requirement for the service. Since stopping a VM would affect the service availability, after the VM is rebooted the min_vm requirement specified in the datamodel may not be satisfied. If the "force" option is true, ESC will ignore the requirement for min_vm.

6.2.2.3.2   Netconf Response

An **rpc-reply** response is returned with a status of **ok** if the request was accepted for activation, or a status of **rpc-error** if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.2.3.3   Event Notifications

When the VM is successfully rebooted, ESC will send a notification:
```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.262+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM successfully rebooted</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <svcid>NULL</svcid>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>VM_REBOOTED</type>
    </event>
  </escEvent>
</notification>
```

When the VM has been rebooted, it will be monitored using ICMP ping. When it gets alive, ESC will send the notification indicating VM is alive:
```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM_Alive event received after rebooted, VM ID:
[CIRROS_HEZH__614__hezh-yesc-0520__hezh-yesc-
0520depCIRROS_HEZH1.6__0__CSR__0]</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>VM_ALIVE</type>
    </event>
  </escEvent>
</notification>
```

If there are errors during rebooting the VM, there will be a final notification indicating the error:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T21:21:00.527+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>FAILURE</status>
    <status_message>VM reboot failed</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <svcid>NULL</svcid>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_source>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
       <type>VM_REBOOTED</type>
    </event>
  </escEvent>
</notification>
```

6.2.2.4   Disable VM Monitor

6.2.2.4.1   Netconf Request

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <edit-config>
    <target>
       <running/>
    </target>
    <config>
      <vmAction xmlns="http://www.cisco.com/esc/esc">
        <actionType>DISABLE_MONITOR</actionType>
        <vmName>sampleVmName</vmName>
        <force>false</force>
      </vmAction>
    </config>
  </edit-config>
</rpc>
```

6.2.2.4.2   Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.2.4.3   Event Notifications

When the monitor of the VM is disabled successfully, ESC will send a notification:

```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-20T00:47:06.591+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Unset monitor completed successfully</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <svcid>NULL</svcid>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
    </vm_target>
```

```
            <event>
               <type>VM_MONITOR_UNSET</type>
            </event>
         </escEvent>
      </notification>
```
If there are errors during disabling the monitor of the VM, there will be a final notification indicating the error:
```
      <?xml version="1.0" encoding="UTF-8"?>
      <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
         <eventTime>2015-05-20T00:47:06.591+00:00</eventTime>
         <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>FAILURE</status>
            <status_message>Unset monitor failed</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <svcid>NULL</svcid>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_group>CSR</vm_group>
            <vm_source>
               <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
               <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
            </vm_source>
            <vm_target>
            </vm_target>
            <event>
               <type>VM_MONITOR_UNSET</type>
            </event>
         </escEvent>
      </notification>
```

6.2.2.5 Enable VM Monitor

6.2.2.5.1   Netconf Request
```
      <rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
         <edit-config>
            <target>
               <running/>
            </target>
            <config>
               <vmAction xmlns="http://www.cisco.com/esc/esc">
                  <actionType>ENABLE_MONITOR</actionType>
                  <vmName>sampleVmName</vmName>
                  <force>false</force>
               </vmAction>
            </config>
         </edit-config>
      </rpc>
```

6.2.2.5.2   Netconf Response
An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.2.5.3   Event Notifications
When the monitor of the VM is enabled successfully, ESC will send a notification:
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2015-05-20T00:50:51.601+00:00</eventTime>
   <escEvent xmlns="http://www.cisco.com/esc/esc">
      <status>SUCCESS</status>
      <status_message>Set monitor completed successfully</status_message>
      <depname>dep</depname>
      <tenant>hezh-yesc-0520</tenant>
      <svcid>NULL</svcid>
      <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
```

```
        <vm_group>CSR</vm_group>
        <vm_source>
          <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
          <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
        </vm_source>
        <vm_target>
    </vm_target>
        <event>
          <type>VM_MONITOR_SET</type>
        </event>
      </escEvent>
</notification>
```

When the VM has been set monitor, it will be monitored using ICMP ping. When it gets alive, ESC will
send the notification indicating VM is alive:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
            <status_message>VM_Alive event received after set monitor, VM ID:
        [CIRROS_HEZH__614__hezh-yesc-0520__hezh-yesc-
        0520depCIRROS_HEZH1.6__0__CSR__0]</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_group>CSR</vm_group>
            <vm_source>
              <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
              <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
            </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>VM_ALIVE</type>
            </event>
          </escEvent>
        </notification>
```

If there are errors during enabling the monitor of the VM, there will be a final notification indicating the
error:

```
        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-20T00:47:06.591+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>FAILURE</status>
            <status_message>Set monitor failed</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <svcid>NULL</svcid>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_group>CSR</vm_group>
            <vm_source>
              <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
              <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
            </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>VM_MONITOR_SET</type>
            </event>
          </escEvent>
        </notification>
```

6.2.2.6 Recovery VM

6.2.2.6.1   Netconf Request

Manual recovery request can be configured to override the predefined recovery action to any desired action.

```
<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <recoveryVmAction xmlns="http://www.cisco.com/esc/esc">
    <actionType>DO</actionType>
    <vmName> sampleVmName </vmName>
    <properties>
        <property>
            <name>action</name>
            <value>REDEPLOY_ONLY</value>
        </property>
    </properties>
  </recoveryVmAction>
</rpc>
```

6.2.2.6.2   Netconf Response

An *rpc-reply* response is returned with a status of *ok* if the request was accepted for activation, or a status of *rpc-error* if the request was rejected. See section **3.2.1 Stage 1: Acceptance or Rejection of** a Configuration Request for more details.

6.2.2.6.3   Event Notifications

When the rpc-reply response is OK, then the recovery begins. This recovery procedure is the same as auto recovery. Event notifications are as follows. Here is the default recovery policy setting: REBOOT_THEN_REDPLOY. For details of recovery workflow, please refer to the ESC user document.

VM Recovery Init
```
<?xml version="1.0" encoding="UTF-8"?>
    <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
    <eventTime>2016-06-23T18:12:04.519+00:00</eventTime>
    <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Recovery event for VM [depzz_g1_0_50521f93-7374-4881-960b-
95aa13d55ddf] triggered. </status_message>
    <depname>depzz</depname>
    <tenant>ttt</tenant>
    <tenant_id>721d0a0aaf5a40299650d4ec74f48f1a</tenant_id>
    <svcid>NULL</svcid>
    <depid>d4778a3a-deba-4df7-9614-03f31f1beab3</depid>
    <vm_group>g1</vm_group>
    <vm_source>
    <vmid>1dd943b9-93a4-4987-b26b-1b8fd264774d</vmid>
    <hostid>4f926bb44423804ea8d87cac946b80e637c315f4f606bfa788b19b8c</hostid>
      <hostname>my-ucs-7</hostname>
  </vm_source>
  <vm_target/>
  <event>
      <type>VM_RECOVERY_INIT</type>
  </event>
 </escEvent>
</notification>
```

VM Recovery Reboot:
```
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2016-06-23T18:12:21.274+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
```

```
      <status_code>200</status_code>
      <status_message>VM [depzz_g1_0_50521f93-7374-4881-960b-95aa13d55ddf] is
rebooted.</status_message>
      <depname>depzz</depname>
      <tenant>ttt</tenant>
      <tenant_id>721d0a0aaf5a40299650d4ec74f48f1a</tenant_id>
      <svcid>NULL</svcid>
      <depid>d4778a3a-deba-4df7-9614-03f31f1beab3</depid>
      <vm_group>g1</vm_group>
      <vm_source>
        <vmid>1dd943b9-93a4-4987-b26b-1b8fd264774d</vmid>
        <hostid>4f926bb44423804ea8d87cac946b80e637c315f4f606bfa788b19b8c</hostid>
        <hostname>my-ucs-7</hostname>
      </vm_source>
      <vm_target/>
      <event>
        <type>VM_RECOVERY_REBOOT</type>
      </event>
    </escEvent>
</notification>


If vm reboot failed:
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2016-06-23T18:30:09.115+00:00</eventTime>
   <escEvent xmlns="http://www.cisco.com/esc/esc">
      <status>FAILURE</status>
      <status_code>500</status_code>
      <status_message>Error Messages: VM [depzz_g1_0_50521f93-7374-4881-960b-
95aa13d55ddf] failed to be rebooted.; VIM Driver: VM powered on but in unexpected
state:null; VM [depzz_g1_0_50521f93-7374-4881-960b-95aa13d55ddf] is rebooted.; VIM
Driver: VM successfully rebooted.; VIM Driver: VM successfully created, VM Name:
[depzz_g1_0_50521f93-7374-4881-960b-95aa13d55ddf]</status_message>
      <depname>depzz</depname>
      <tenant>ttt</tenant>
      <tenant_id>721d0a0aaf5a40299650d4ec74f48f1a</tenant_id>
      <svcid>NULL</svcid>
      <depid>d4778a3a-deba-4df7-9614-03f31f1beab3</depid>
      <vm_group>g1</vm_group>
      <vm_source>
        <vmid>1dd943b9-93a4-4987-b26b-1b8fd264774d</vmid>
        <hostid>4f926bb44423804ea8d87cac946b80e637c315f4f606bfa788b19b8c</hostid>
        <hostname>my-ucs-7</hostname>
      </vm_source>
      <vm_target/>
      <event>
        <type>VM_RECOVERY_REBOOT</type>
      </event>
    </escEvent>
</notification>
```
After that, recovery procedure will redeploy vm:
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2016-06-23T18:30:12.249+00:00</eventTime>
   <escEvent xmlns="http://www.cisco.com/esc/esc">
      <status>SUCCESS</status>
      <status_code>204</status_code>
      <status_message>VM [depzz_g1_0_50521f93-7374-4881-960b-95aa13d55ddf] has been
undeployed.</status_message>
      <depname>depzz</depname>
      <tenant>ttt</tenant>
      <tenant_id>721d0a0aaf5a40299650d4ec74f48f1a</tenant_id>
      <svcid>NULL</svcid>
      <depid>d4778a3a-deba-4df7-9614-03f31f1beab3</depid>
      <vm_group>g1</vm_group>
      <vm_source>
        <vmid>1dd943b9-93a4-4987-b26b-1b8fd264774d</vmid>
        <hostid>4f926bb44423804ea8d87cac946b80e637c315f4f606bfa788b19b8c</hostid>
        <hostname>my-ucs-7</hostname>
      </vm_source>
      <vm_target/>
      <event>
```

```
      <type>VM_RECOVERY_UNDEPLOYED</type>
    </event>
  </escEvent>
</notification>
 <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2016-06-23T18:30:20.256+00:00</eventTime>
   <escEvent xmlns="http://www.cisco.com/esc/esc">
     <status>SUCCESS</status>
     <status_code>200</status_code>
     <status_message>VM [depzz_g1_0_50521f93-7374-4881-960b-95aa13d55ddf] has been
deployed as part of recovery.</status_message>
     <depname>depzz</depname>
     <tenant>ttt</tenant>
     <tenant_id>721d0a0aaf5a40299650d4ec74f48f1a</tenant_id>
     <svcid>NULL</svcid>
     <depid>d4778a3a-deba-4df7-9614-03f31f1beab3</depid>
     <vm_group>g1</vm_group>
     <vm_source>
       <vmid>1dd943b9-93a4-4987-b26b-1b8fd264774d</vmid>
       <hostid>4f926bb44423804ea8d87cac946b80e637c315f4f606bfa788b19b8c</hostid>
       <hostname>my-ucs-7</hostname>
     </vm_source>
     <vm_target>
       <vmid>22d210a1-15e1-4e2b-a7a9-9796ec7b259c</vmid>
       <hostid>4f926bb44423804ea8d87cac946b80e637c315f4f606bfa788b19b8c</hostid>
       <hostname>my-ucs-7</hostname>
       <interfaces>
         <interface>
           <nicid>0</nicid>
           <type>virtual</type>
           <port_id>71fd1601-f78b-41ce-a518-48fae917affb</port_id>
           <network>943fda9e-79f8-400c-b442-3506f102721a</network>
           <subnet>e313b95c-ca1f-4c81-8d60-c9e721a85d0b</subnet>
           <ip_address>192.168.0.75</ip_address>
           <mac_address>fa:16:3e:e9:23:f7</mac_address>
           <netmask>255.255.255.0</netmask>
           <gateway>192.168.0.1</gateway>
         </interface>
       </interfaces>
     </vm_target>
     <event>
       <type>VM_RECOVERY_DEPLOYED</type>
     </event>
   </escEvent>
</notification>
```

Finally, vm recovery complete is received.

```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
   <eventTime>2016-06-23T18:30:36.069+00:00</eventTime>
   <escEvent xmlns="http://www.cisco.com/esc/esc">
     <status>SUCCESS</status>
     <status_code>200</status_code>
     <status_message>Recovery: Successfully recovered VM [depzz_g1_0_50521f93-7374-
4881-960b-95aa13d55ddf].</status_message>
     <depname>depzz</depname>
     <tenant>ttt</tenant>
     <tenant_id>721d0a0aaf5a40299650d4ec74f48f1a</tenant_id>
     <svcid>NULL</svcid>
     <depid>d4778a3a-deba-4df7-9614-03f31f1beab3</depid>
     <vm_group>g1</vm_group>
     <vm_source>
       <vmid>1dd943b9-93a4-4987-b26b-1b8fd264774d</vmid>
       <hostid>4f926bb44423804ea8d87cac946b80e637c315f4f606bfa788b19b8c</hostid>
       <hostname>my-ucs-7</hostname>
     </vm_source>
     <vm_target>
       <vmid>22d210a1-15e1-4e2b-a7a9-9796ec7b259c</vmid>
       <hostid>4f926bb44423804ea8d87cac946b80e637c315f4f606bfa788b19b8c</hostid>
       <hostname>my-ucs-7</hostname>
       <interfaces>
```

```
            <interface>
                <nicid>0</nicid>
                <type>virtual</type>
                <port_id>71fd1601-f78b-41ce-a518-48fae917affb</port_id>
                <network>943fda9e-79f8-400c-b442-3506f102721a</network>
                <subnet>e313b95c-ca1f-4c81-8d60-c9e721a85d0b</subnet>
                <ip_address>192.168.0.75</ip_address>
                <mac_address>fa:16:3e:e9:23:f7</mac_address>
                <netmask>255.255.255.0</netmask>
                <gateway>192.168.0.1</gateway>
            </interface>
        </interfaces>
    </vm_target>
    <event>
        <type>VM_RECOVERY_COMPLETE</type>
    </event>
  </escEvent>
</notification>
```

6.2.2.7 Confirm Resize VM

6.2.2.7.1 Netconf Request

```
<rpc  message-id="1"  xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
 <edit-config>
 <target>
 <running/>
 </target>
 <config>
 <vmAction  xmlns="http://www.cisco.com/esc/esc">
     <actionType>CONFIRM_RESIZE</actionType>
 <vmName>sampleVmName</vmName>
 </vmAction>
 </config>
 </edit-config>
</rpc>
```

6.2.2.7.2 NetConf Response

An rpc-reply response is returned with a status of ok if the request was accepted for activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details.

6.2.7.3.2   Event Notifications

For the confirm resize of VM, the notification is shown as follows.

When the VM is successfully resized , ESC will send a notification:

```
<?xml version="1.0"  encoding="UTF-8"?>
<notification    xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-25T12:51:03.67+00:00</eventTime>
  <vm-resize-event  xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>Confirm  Resize request  triggered</status_message>
   <vmid>70e0fcb5-d3c7-4524-aa05-7b6d348bf6ad</vmid>
   <vm_name>jenkins-vm-resize</vm_name>
   <event>
       <type>VM_CONFIRM_RESIZE_INIT</type>
   </event>
  </vm-resize-event>
</notification>

<?xml version="1.0"  encoding="UTF-8"?>
<notification    xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
```

  <eventTime>2024-06-25T12:51:13.19+00:00</eventTime>
 <escEvent xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
  <status_message>Confirm Resize done for VM [udh-j-vm-re_Grp1_0_89e5a7b0-7474-466c-b99a-df969e4f81fc]</status_message>
  <depname>udh-j-vm-resize-dep-123615</depname>
  <tenant>udh-j-vm-resize-tenant-123615</tenant>
  <tenant_id>8ccb79eb60014377b54a477e27cab9d0</tenant_id>
  <depid>f1378eda-34d8-49c0-837d-cc00830423f1</depid>
  <vm_group>Grp1</vm_group>
  <vm_source>
   <vmid>70e0fcb5-d3c7-4524-aa05-7b6d348bf6ad</vmid>
   <vmname>jenkins-vm-resize</vmname>
   <generated_vmname>udh-j-vm-re_Grp1_0_89e5a7b0-7474-466c-b99a-df969e4f81fc</generated_vmname>
   <vim_id>default_openstack_vim</vim_id>
   <vim_project>udh-j-vm-resize-tenant-123615</vim_project>
   <vim_project_id>8ccb79eb60014377b54a477e27cab9d0</vim_project_id>
   <hostid>6798e40c9dcc6e6f65054e0fb3b23dd5d8e47f02cced95b6888004bd</hostid>
   <hostname>my-ucs-3</hostname>
  </vm_source>
  <event>
   <type>VM_CONFIRM_RESIZE_COMPLETE</type>
  </event>
 </escEvent>
</notification>

When the VM has been successfully resized, it will be monitored using ICMP ping. When it gets alive, ESC will send the notification indicating VM is alive

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-25T12:51:31.311+00:00</eventTime>
 <escEvent xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
  <status_message>Successfully confirmed the resize for VM [udh-j-vm-re_Grp1_0_89e5a7b0-7474-466c-b99a-df969e4f81fc].</status_message>
  <depname>udh-j-vm-resize-dep-123615</depname>
  <tenant>udh-j-vm-resize-tenant-123615</tenant>
  <tenant_id>8ccb79eb60014377b54a477e27cab9d0</tenant_id>
  <depid>f1378eda-34d8-49c0-837d-cc00830423f1</depid>
  <vm_group>Grp1</vm_group>
  <vm_source>
   <vmid>70e0fcb5-d3c7-4524-aa05-7b6d348bf6ad</vmid>
   <vmname>jenkins-vm-resize</vmname>
   <generated_vmname>udh-j-vm-re_Grp1_0_89e5a7b0-7474-466c-b99a-df969e4f81fc</generated_vmname>
   <vim_id>default_openstack_vim</vim_id>
   <vim_project>udh-j-vm-resize-tenant-123615</vim_project>
   <vim_project_id>8ccb79eb60014377b54a477e27cab9d0</vim_project_id>
   <hostid>6798e40c9dcc6e6f65054e0fb3b23dd5d8e47f02cced95b6888004bd</hostid>
   <hostname>my-ucs-3</hostname>
  </vm_source>
  <event>
   <type>VM_ALIVE</type>
  </event>
 </escEvent>
</notification>

If there are errors during confirming the resize of VM, there will be a notification indicating the error

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-25T13:02:05.684+00:00</eventTime>
 <vm-resize-event xmlns="http://www.cisco.com/esc/esc">
  <status>FAILURE</status>

```xml
    <status_code>500</status_code>
    <status_message>Failed to perform [CONFIRM_RESIZE] on vm [71ae1c8c-5011-4183-8df1-7170fe2ca489]: Request was successfully
processed</status_message>
    <vmid>71ae1c8c-5011-4183-8df1-7170fe2ca489</vmid>
    <vm_name>jenkins-vm-resize</vm_name>
    <event>
     <type>VM_CONFIRM_RESIZE_INIT</type>
    </event>
  </vm-resize-event>
</notification>

<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-25T13:02:05.783+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>FAILURE</status>
   <status_code>500</status_code>
   <status_message>Error in confirming the resize for VM [udh-j-vm-re_Grp1_0_be769329-4783-437f-a622-2d27526ab771].</status_message>
   <depname>udh-j-vm-resize-dep-123615</depname>
   <tenant>udh-j-vm-resize-tenant-123615</tenant>
   <tenant_id>8ccb79eb60014377b54a477e27cab9d0</tenant_id>
   <depid>075ea1f3-dd24-4600-a168-d348943ee3de</depid>
   <vm_group>Grp1</vm_group>
   <vm_source>
     <vmid>71ae1c8c-5011-4183-8df1-7170fe2ca489</vmid>
     <vmname>jenkins-vm-resize</vmname>
     <generated_vmname>udh-j-vm-re_Grp1_0_be769329-4783-437f-a622-2d27526ab771</generated_vmname>
     <vim_id>default_openstack_vim</vim_id>
     <vim_project>udh-j-vm-resize-tenant-123615</vim_project>
     <vim_project_id>8ccb79eb60014377b54a477e27cab9d0</vim_project_id>
     <hostid>6798e40c9dcc6e6f65054e0fb3b23dd5d8e47f02cced95b6888004bd</hostid>
     <hostname>my-ucs-3</hostname>
   </vm_source>
   <event>
     <type>VM_CONFIRM_RESIZE_COMPLETE</type>
   </event>
  </escEvent>
</notification>
```

6.2.2.8 Revert Resize VM

6.2.2.8.1 Netconf Request

```xml
<rpc  message-id="1"  xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
 <edit-config>
 <target>
<running/>
 </target>
 <config>
<vmAction xmlns="http://www.cisco.com/esc/esc">
 <actionType>REVERT_RESIZE</actionType>
 <vmName>sampleVmName</vmName>
</vmAction>
 </config>
 </edit-config>
</rpc>
```

6.2.2.8.2 Netconf Response

An rpc-reply response is returned with a status of ok if the request was accepted for
activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1:
Acceptance or Rejection of a Configuration Request for more details.

6.2.2.8.3 Event Notifications

For the revert resize of VM, the notification is shown as follows.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-25T12:53:59.789+00:00</eventTime>
  <vm-resize-event xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Revert Resize request triggered</status_message>
    <vmid>b9c03ed3-36d4-4cbf-ba33-982a8a43737f</vmid>
    <vm_name>jenkins-vm-resize</vm_name>
    <event>
      <type>VM_REVERT_RESIZE_INIT</type>
    </event>
  </vm-resize-event>
</notification>

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-25T12:54:24.692+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Revert Resize done for VM [udh-j-vm-re_Grp1_0_5a2827a1-8ba9-415f-a821-5d229d87eea9]</status_message>
    <depname>udh-j-vm-resize-dep-123615</depname>
    <tenant>udh-j-vm-resize-tenant-123615</tenant>
    <tenant_id>8ccb79eb60014377b54a477e27cab9d0</tenant_id>
    <depid>1f2227f6-7af0-4576-8d95-ac712036f17c</depid>
    <vm_group>Grp1</vm_group>
    <vm_source>
      <vmid>b9c03ed3-36d4-4cbf-ba33-982a8a43737f</vmid>
      <vmname>jenkins-vm-resize</vmname>
      <generated_vmname>udh-j-vm-re_Grp1_0_5a2827a1-8ba9-415f-a821-5d229d87eea9</generated_vmname>
      <vim_id>default_openstack_vim</vim_id>
      <vim_project>udh-j-vm-resize-tenant-123615</vim_project>
      <vim_project_id>8ccb79eb60014377b54a477e27cab9d0</vim_project_id>
      <hostid>6798e40c9dcc6e6f65054e0fb3b23dd5d8e47f02cced95b6888004bd</hostid>
      <hostname>my-ucs-3</hostname>
    </vm_source>
    <vm_target>
      <vmid>b9c03ed3-36d4-4cbf-ba33-982a8a43737f</vmid>
      <vmname>jenkins-vm-resize</vmname>
      <generated_vmname>udh-j-vm-re_Grp1_0_5a2827a1-8ba9-415f-a821-5d229d87eea9</generated_vmname>
      <hostid>7532bba4851f009a14cf5b327755a26a5c00303d96cae12af6f54dc8</hostid>
      <hostname>my-ucs-2</hostname>
      <interfaces>
        <interface>
          <nicid>1</nicid>
          <type>virtual</type>
          <vim_interface_name>udh-j-vm-re_Grp1_0_5a2827a1-8ba9-415f-a821-5d229d87eea9</vim_interface_name>
          <port_id>868b9f0b-3a61-4cee-964f-1d6c54113c29</port_id>
          <network>c58e3301-e029-4114-96e7-074e617ddad2</network>
          <mac_address>fa:16:3e:77:7b:03</mac_address>
          <security_groups>default</security_groups>
          <address>
            <address_id>0</address_id>
            <subnet>3c98dee5-86f7-40a2-bcb0-93831d87ae7e</subnet>
            <ip_address>20.201.1.20</ip_address>
            <prefix>24</prefix>
            <gateway>20.201.1.1</gateway>
          </address>
```

```
          </interface>
          <interface>
           <nicid>0</nicid>
           <type>virtual</type>
           <vim_interface_name>udh-j-vm-re_Grp1_0_5a2827a1-8ba9-415f-a821-5d229d87eea9</vim_interface_name>
           <port_id>8ac3bd32-509a-4b29-9444-f70f911c078c</port_id>
           <network>aa73b96e-dc37-465a-8d21-5881b8994a10</network>
           <subnet>69e0e585-0207-4bdd-9ccc-e98dc532cbcd</subnet>
           <ip_address>172.29.0.16</ip_address>
           <mac_address>fa:16:3e:06:8a:94</mac_address>
           <netmask>255.255.240.0</netmask>
           <gateway>172.29.0.1</gateway>
           <security_groups>default</security_groups>
          </interface>
         </interfaces>
        </vm_target>
        <event>
         <type>VM_REVERT_RESIZE_COMPLETE</type>
        </event>
       </escEvent>
      </notification>
```

When the VM has been successfully revert the resize, it will be monitored using ICMP ping. When it gets alive, ESC will send
the notification indicating VM is alive

```
<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-25T12:54:40.279+00:00</eventTime>
 <escEvent xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
  <status_message>Successfully reverted the resize for VM [udh-j-vm-re_Grp1_0_5a2827a1-8ba9-415f-a821-5d229d87eea9].</status_message>
  <depname>udh-j-vm-resize-dep-123615</depname>
  <tenant>udh-j-vm-resize-tenant-123615</tenant>
  <tenant_id>8ccb79eb60014377b54a477e27cab9d0</tenant_id>
  <depid>1f2227f6-7af0-4576-8d95-ac712036f17c</depid>
  <vm_group>Grp1</vm_group>
  <vm_source>
   <vmid>b9c03ed3-36d4-4cbf-ba33-982a8a43737f</vmid>
   <vmname>jenkins-vm-resize</vmname>
   <generated_vmname>udh-j-vm-re_Grp1_0_5a2827a1-8ba9-415f-a821-5d229d87eea9</generated_vmname>
   <vim_id>default_openstack_vim</vim_id>
   <vim_project>udh-j-vm-resize-tenant-123615</vim_project>
   <vim_project_id>8ccb79eb60014377b54a477e27cab9d0</vim_project_id>
   <hostid>7532bba4851f009a14cf5b327755a26a5c00303d96cae12af6f54dc8</hostid>
   <hostname>my-ucs-2</hostname>
  </vm_source>
  <event>
   <type>VM_ALIVE</type>
  </event>
 </escEvent>
</notification>
```

In ESC, the flavor change request is at VM Group level. But a VM Group can have more than one VMs.
This resize feature works only when the VM Group has single VM in it.

6.2.2.9   Migrate VM

In case of live migration,

6.2.2.9.1   Netconf Request

```
<rpc  message-id="1"  xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
 <edit-config>
 <target>
<running/>
 </target>
 <config>
<vmMigrate  xmlns="http://www.cisco.com/esc/esc">
 <vmName>test-dep_g1_0_6be93ee9-f7fb-473e-a3f6-eca281802008</vmName>
 <migrationType>live</migrationType>
 <host>pf-ucs-24</host>
</vmMigrate>
 </config>
 </edit-config>
</rpc>
```

6.2.2.9.2   Netconf Response

An rpc-reply response is returned with a status of ok if the request was accepted for activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details.

6.2.2.9.3 Event Notification

For the live migration of VM, When the VM is successfully migrated, ESC will send the notification as follows

```
<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-26T10:37:39.237+00:00</eventTime>
 <escEvent xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
  <status_message>VM Migrate [udh-j-vm_mi_Grp1_0_a2f302b5-9081-48c1-92b8-c08fed175706] initializes.</status_message>
  <depname>udh-j-vm_migrate_dep-673515</depname>
  <tenant>udh-j-vm_migrate_tenant-673515</tenant>
  <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
  <depid>09040138-5f32-446b-b28a-af0145b3dde1</depid>
  <vm_group>Grp1</vm_group>
  <vm_source>
   <vmid>3155d0df-e5f8-4e8a-9f53-95905ae2e86a</vmid>
   <vmname>jenkins-vm-migrate</vmname>
   <generated_vmname>udh-j-vm_mi_Grp1_0_a2f302b5-9081-48c1-92b8-c08fed175706</generated_vmname>
   <vim_id>default_openstack_vim</vim_id>
   <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
   <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
   <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>
   <hostname>my-ucs-2</hostname>
  </vm_source>
  <event>
   <type>VM_MIGRATE_INIT</type>
  </event>
 </escEvent>
</notification>

<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-26T10:38:05.434+00:00</eventTime>
 <escEvent xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
```

    <status_code>200</status_code>
    <status_message>Migrated VM [udh-j-vm_mi_Grp1_0_a2f302b5-9081-48c1-92b8-c08fed175706] successfully.</status_message>
    <depname>udh-j-vm_migrate_dep-673515</depname>
    <tenant>udh-j-vm_migrate_tenant-673515</tenant>
    <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
    <depid>09040138-5f32-446b-b28a-af0145b3dde1</depid>
    <vm_group>Grp1</vm_group>
    <vm_source>
     <vmid>3155d0df-e5f8-4e8a-9f53-95905ae2e86a</vmid>
     <vmname>jenkins-vm-migrate</vmname>
     <generated_vmname>udh-j-vm_mi_Grp1_0_a2f302b5-9081-48c1-92b8-c08fed175706</generated_vmname>
     <vim_id>default_openstack_vim</vim_id>
     <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
     <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
     <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>
     <hostname>my-ucs-2</hostname>
    </vm_source>
    <vm_target>
     <vmid>3155d0df-e5f8-4e8a-9f53-95905ae2e86a</vmid>
     <vmname>jenkins-vm-migrate</vmname>
     <generated_vmname>udh-j-vm_mi_Grp1_0_a2f302b5-9081-48c1-92b8-c08fed175706</generated_vmname>
     <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>
     <hostname>my-ucs-2</hostname>
     <interfaces>
      <interface>
       <nicid>0</nicid>
       <type>virtual</type>
       <vim_interface_name>udh-j-vm_mi_Grp1_0_a2f302b5-9081-48c1-92b8-c08fed175706</vim_interface_name>
       <port_id>b1dae156-c6e7-4b0a-a5f4-d0d4b22834ba</port_id>
       <network>aa73b96e-dc37-465a-8d21-5881b8994a10</network>
       <subnet>69e0e585-0207-4bdd-9ccc-e98dc532cbcd</subnet>
       <ip_address>172.29.0.18</ip_address>
       <mac_address>fa:16:3e:5c:29:68</mac_address>
       <netmask>255.255.240.0</netmask>
       <gateway>172.29.0.1</gateway>
       <security_groups>default</security_groups>
      </interface>
     </interfaces>
    </vm_target>
    <event>
     <type>VM_MIGRATED</type>
    </event>
   </escEvent>
  </notification>

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-26T10:38:22.3+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>Migrate for VM [udh-j-vm_mi_Grp1_0_a2f302b5-9081-48c1-92b8-c08fed175706] is successful.</status_message>
   <depname>udh-j-vm_migrate_dep-673515</depname>
   <tenant>udh-j-vm_migrate_tenant-673515</tenant>
   <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
   <depid>09040138-5f32-446b-b28a-af0145b3dde1</depid>
   <vm_group>Grp1</vm_group>
   <vm_source>
    <vmid>3155d0df-e5f8-4e8a-9f53-95905ae2e86a</vmid>
    <vmname>jenkins-vm-migrate</vmname>
    <generated_vmname>udh-j-vm_mi_Grp1_0_a2f302b5-9081-48c1-92b8-c08fed175706</generated_vmname>
    <vim_id>default_openstack_vim</vim_id>
    <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
    <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
    <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>

```
      <hostname>my-ucs-2</hostname>
     </vm_source>
     <event>
      <type>VM_MIGRATE_COMPLETE</type>
     </event>
   </escEvent>
 </notification>
```

For cold migration,

6.2.2.9.4 Netconf Request
```
<rpc  message-id="1"  xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
 <edit-config>
 <target>
<running/>
 </target>
 <config>
<vmMigrate  xmlns="http://www.cisco.com/esc/esc">
 <vmName>test-dep_g1_0_6be93ee9-f7fb-473e-a3f6-eca281802008</vmName>
 <migrationType>cold</migrationType>
 <host>pf-ucs-24</host>
</vmMigrate>
 </config>
 </edit-config>
</rpc>
```

6.2.2.9.5 Netconf Response
An rpc-reply response is returned with a status of ok if the request was accepted for activation, or a status of rpc-error if the request was rejected. See section 3.2.1 Stage 1: Acceptance or Rejection of a Configuration Request for more details.

6.2.2.9.6 Event Notifications
For the cold migration of VM, When the VM is successfully migrated, ESC will send the notification as follows
```
<?xml version="1.0" encoding="UTF-8"?>
<notification  xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-26T10:31:51.4+00:00</eventTime>
 <escEvent xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
  <status_message>VM Migrate [udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3] initializes.</status_message>
  <depname>udh-j-vm_migrate_dep-673515</depname>
  <tenant>udh-j-vm_migrate_tenant-673515</tenant>
  <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
  <depid>eebd4fd6-827c-42e4-b486-f62157f8615f</depid>
  <vm_group>Grp1</vm_group>
  <vm_source>
   <vmid>7cb5bb53-4e7e-471b-82b1-0430f111da6e</vmid>
   <vmname>jenkins-vm-migrate</vmname>
   <generated_vmname>udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3</generated_vmname>
   <vim_id>default_openstack_vim</vim_id>
   <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
   <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
   <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>
   <hostname>my-ucs-2</hostname>
  </vm_source>
  <event>
   <type>VM_MIGRATE_INIT</type>
  </event>
 </escEvent>
</notification>
```

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-26T10:32:20.704+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>Migrated VM  [udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3] successfully.</status_message>
   <depname>udh-j-vm_migrate_dep-673515</depname>
   <tenant>udh-j-vm_migrate_tenant-673515</tenant>
   <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
   <depid>eebd4fd6-827c-42e4-b486-f62157f8615f</depid>
   <vm_group>Grp1</vm_group>
   <vm_source>
    <vmid>7cb5bb53-4e7e-471b-82b1-0430f111da6e</vmid>
    <vmname>jenkins-vm-migrate</vmname>
    <generated_vmname>udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3</generated_vmname>
    <vim_id>default_openstack_vim</vim_id>
    <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
    <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
    <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>
    <hostname>my-ucs-2</hostname>
   </vm_source>
   <vm_target>
    <vmid>7cb5bb53-4e7e-471b-82b1-0430f111da6e</vmid>
    <vmname>jenkins-vm-migrate</vmname>
    <generated_vmname>udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3</generated_vmname>
    <hostid>061064e891c568b5cdcd85429032c531f75f87e3c3409a1eaa44f6ae</hostid>
    <hostname>my-ucs-3</hostname>
    <interfaces>
     <interface>
      <nicid>0</nicid>
      <type>virtual</type>
      <vim_interface_name>udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3</vim_interface_name>
      <port_id>01e2c739-1367-4b70-ab36-e633ad2f5918</port_id>
      <network>aa73b96e-dc37-465a-8d21-5881b8994a10</network>
      <subnet>69e0e585-0207-4bdd-9ccc-e98dc532cbcd</subnet>
      <ip_address>172.29.0.19</ip_address>
      <mac_address>fa:16:3e:9c:78:9a</mac_address>
      <netmask>255.255.240.0</netmask>
      <gateway>172.29.0.1</gateway>
      <security_groups>default</security_groups>
     </interface>
    </interfaces>
   </vm_target>
   <event>
    <type>VM_MIGRATED</type>
   </event>
  </escEvent>
 </notification>

<?xml version="1.0"  encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-26T10:32:21.48+00:00</eventTime>
  <escEvent  xmlns="http://www.cisco.com/esc/esc">
   <status>SUCCESS</status>
   <status_code>200</status_code>
   <status_message>Migrate for VM [udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3] is successful.</status_message>
   <depname>udh-j-vm_migrate_dep-673515</depname>
   <tenant>udh-j-vm_migrate_tenant-673515</tenant>
   <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
   <depid>eebd4fd6-827c-42e4-b486-f62157f8615f</depid>
   <vm_group>Grp1</vm_group>
   <vm_source>
    <vmid>7cb5bb53-4e7e-471b-82b1-0430f111da6e</vmid>
```

```xml
      <vmname>jenkins-vm-migrate</vmname>
      <generated_vmname>udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3</generated_vmname>
      <vim_id>default_openstack_vim</vim_id>
      <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
      <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
      <hostid>061064e891c568b5cdcd85429032c531f75f87e3c3409a1eaa44f6ae</hostid>
      <hostname>my-ucs-3</hostname>
    </vm_source>
    <event>
      <type>VM_VERIFY_RESIZE</type>
    </event>
  </escEvent>
 </notification>
```
For confirmation of the resize, the notification is shown as follows
```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-26T10:32:33.207+00:00</eventTime>
 <vm-resize-event  xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
  <status_message>Confirm Resize request triggered</status_message>
  <vmid>7cb5bb53-4e7e-471b-82b1-0430f111da6e</vmid>
  <vm_name>jenkins-vm-migrate</vm_name>
  <event>
   <type>VM_CONFIRM_RESIZE_INIT</type>
  </event>
 </vm-resize-event>
</notification>
```

```
2024-06-26 10:32:52.264 TestLog INFO  [NotificationManager.waitAndGetNextNotification:390] [tid=5296] Not Empty ..about to get
```
```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-26T10:32:51.471+00:00</eventTime>
 <escEvent  xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
  <status_message>Confirm Resize done for VM [udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3]</status_message>
  <depname>udh-j-vm_migrate_dep-673515</depname>
  <tenant>udh-j-vm_migrate_tenant-673515</tenant>
  <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
  <depid>eebd4fd6-827c-42e4-b486-f62157f8615f</depid>
  <vm_group>Grp1</vm_group>
  <vm_source>
   <vmid>7cb5bb53-4e7e-471b-82b1-0430f111da6e</vmid>
   <vmname>jenkins-vm-migrate</vmname>
   <generated_vmname>udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3</generated_vmname>
   <vim_id>default_openstack_vim</vim_id>
   <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
   <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
   <hostid>061064e891c568b5cdcd85429032c531f75f87e3c3409a1eaa44f6ae</hostid>
   <hostname>my-ucs-3</hostname>
  </vm_source>
  <event>
   <type>VM_CONFIRM_RESIZE_COMPLETE</type>
  </event>
 </escEvent>
</notification>


<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-26T10:33:07.3+00:00</eventTime>
 <escEvent  xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
```

    <status_message>Successfully confirmed the resize for VM [udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3].</status_message>
    <depname>udh-j-vm_migrate_dep-673515</depname>
    <tenant>udh-j-vm_migrate_tenant-673515</tenant>
    <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
    <depid>eebd4fd6-827c-42e4-b486-f62157f8615f</depid>
    <vm_group>Grp1</vm_group>
    <vm_source>
      <vmid>7cb5bb53-4e7e-471b-82b1-0430f111da6e</vmid>
      <vmname>jenkins-vm-migrate</vmname>
      <generated_vmname>udh-j-vm_mi_Grp1_0_17372eb8-d4c1-49d3-86dc-96bb2eeb5ac3</generated_vmname>
      <vim_id>default_openstack_vim</vim_id>
      <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
      <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
      <hostid>061064e891c568b5cdcd85429032c531f75f87e3c3409a1eaa44f6ae</hostid>
      <hostname>my-ucs-3</hostname>
    </vm_source>
    <event>
      <type>VM_ALIVE</type>
    </event>
  </escEvent>
</notification>

For revert resize, the notification is shown as follows

<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-26T10:35:29.745+00:00</eventTime>
  <vm-resize-event xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Revert Resize request triggered</status_message>
    <vmid>be9814b1-6fd6-4591-96ec-a0706b0c4489</vmid>
    <vm_name>jenkins-vm-migrate</vm_name>
    <event>
      <type>VM_REVERT_RESIZE_INIT</type>
    </event>
  </vm-resize-event>
</notification>

<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2024-06-26T10:35:54.738+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_code>200</status_code>
    <status_message>Revert Resize done for VM [udh-j-vm_mi_Grp1_0_9d434ad4-21a6-43f2-bce0-5b7b7cf13335]</status_message>
    <depname>udh-j-vm_migrate_dep-673515</depname>
    <tenant>udh-j-vm_migrate_tenant-673515</tenant>
    <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
    <depid>2c26664e-3ed3-49fe-a3d8-4e475ac517c0</depid>
    <vm_group>Grp1</vm_group>
    <vm_source>
      <vmid>be9814b1-6fd6-4591-96ec-a0706b0c4489</vmid>
      <vmname>jenkins-vm-migrate</vmname>
      <generated_vmname>udh-j-vm_mi_Grp1_0_9d434ad4-21a6-43f2-bce0-5b7b7cf13335</generated_vmname>
      <vim_id>default_openstack_vim</vim_id>
      <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
      <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
      <hostid>061064e891c568b5cdcd85429032c531f75f87e3c3409a1eaa44f6ae</hostid>
      <hostname>my-ucs-3</hostname>
    </vm_source>
    <vm_target>
      <vmid>be9814b1-6fd6-4591-96ec-a0706b0c4489</vmid>
      <vmname>jenkins-vm-migrate</vmname>
      <generated_vmname>udh-j-vm_mi_Grp1_0_9d434ad4-21a6-43f2-bce0-5b7b7cf13335</generated_vmname>
      <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>

```xml
      <hostname>my-ucs-2</hostname>
      <interfaces>
       <interface>
        <nicid>0</nicid>
        <type>virtual</type>
        <vim_interface_name>udh-j-vm_mi_Grp1_0_9d434ad4-21a6-43f2-bce0-5b7b7cf13335</vim_interface_name>
        <port_id>7393e55a-6b9d-4149-bed3-6062e6a23318</port_id>
        <network>aa73b96e-dc37-465a-8d21-5881b8994a10</network>
        <subnet>69e0e585-0207-4bdd-9ccc-e98dc532cbcd</subnet>
        <ip_address>172.29.0.53</ip_address>
        <mac_address>fa:16:3e:a9:99:ef</mac_address>
        <netmask>255.255.240.0</netmask>
        <gateway>172.29.0.1</gateway>
        <security_groups>default</security_groups>
       </interface>
      </interfaces>
     </vm_target>
     <event>
      <type>VM_REVERT_RESIZE_COMPLETE</type>
     </event>
    </escEvent>
   </notification>


<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-26T10:36:10.262+00:00</eventTime>
 <escEvent xmlns="http://www.cisco.com/esc/esc">
  <status>SUCCESS</status>
  <status_code>200</status_code>
  <status_message>Successfully reverted the resize for VM [udh-j-vm_mi_Grp1_0_9d434ad4-21a6-43f2-bce0-5b7b7cf13335].</status_message>
  <depname>udh-j-vm_migrate_dep-673515</depname>
  <tenant>udh-j-vm_migrate_tenant-673515</tenant>
  <tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
  <depid>2c26664e-3ed3-49fe-a3d8-4e475ac517c0</depid>
  <vm_group>Grp1</vm_group>
  <vm_source>
   <vmid>be9814b1-6fd6-4591-96ec-a0706b0c4489</vmid>
   <vmname>jenkins-vm-migrate</vmname>
   <generated_vmname>udh-j-vm_mi_Grp1_0_9d434ad4-21a6-43f2-bce0-5b7b7cf13335</generated_vmname>
   <vim_id>default_openstack_vim</vim_id>
   <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
   <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
   <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>
   <hostname>my-ucs-2</hostname>
  </vm_source>
  <event>
   <type>VM_ALIVE</type>
  </event>
 </escEvent>
</notification>
```

If there are errors during migrating the VM, there will be a notification indicating the error:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification   xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
 <eventTime>2024-06-26T10:49:34.528+00:00</eventTime>
 <escEvent xmlns="http://www.cisco.com/esc/esc">
  <status>FAILURE</status>
  <status_code>500</status_code>
  <status_message>Error Migrating VM [udh-j-vm_mi_Grp1_0_3c4f33b7-db27-4c8b-bf18-f87e2e70b2d6]. VIM Driver: Failed to perform [MIGRATE]
on vm [3bbe0944-7921-4f3b-a7f5-3fc735be1a30]: Perform action [MIGRATE] to vm [jenkins-vm-migrate] failed. {message=my-ucs-2 is not on shared
storage: Shared storage live-migration requires either shared storage or boot-from-volume with no local disks., status=400, status-code=400
BAD_REQUEST}</status_message>
  <depname>udh-j-vm_migrate_dep-673515</depname>
  <tenant>udh-j-vm_migrate_tenant-673515</tenant>
```

```
<tenant_id>427bdea717e043deab6b4524192acd85</tenant_id>
<depid>4c8f7aaf-3727-428b-a75f-5fb615a52cf6</depid>
<vm_group>Grp1</vm_group>
<vm_source>
  <vmid>3bbe0944-7921-4f3b-a7f5-3fc735be1a30</vmid>
  <vmname>jenkins-vm-migrate</vmname>
  <generated_vmname>udh-j-vm_mi_Grp1_0_3c4f33b7-db27-4c8b-bf18-f87e2e70b2d6</generated_vmname>
  <vim_id>default_openstack_vim</vim_id>
  <vim_project>udh-j-vm_migrate_tenant-673515</vim_project>
  <vim_project_id>427bdea717e043deab6b4524192acd85</vim_project_id>
  <hostid>4e56f5814171cbb503a428845c149835c48c3b05075284a95ca697ec</hostid>
  <hostname>my-ucs-2</hostname>
</vm_source>
<event>
  <type>VM_MIGRATE_COMPLETE</type>
</event>
</escEvent>
</notification>
```

6.3 ESC System API

6.3.1 Log API

ESC provides a rpc api to fetch deployment level logs via netconf yang interface. The api will allow to filter the logs. The search field includes "Tenant", "Deployment Name", "VM Name".

6.3.1.1 Request

```
<filterLog xmlns="http://www.cisco.com/esc/esc">
    <log_level>INFO</log_level>
    <log_count>1</log_count>
    <classifications>
        <classification>OS</classification>
        <classification>SM</classification>
    </classifications>
    <tags>
        <tag>
            <name>depName</name>
            <value>CSR_ap1</value>
        </tag>
        <tag>
            <name>tenant</name>
            <value>admin</value>
        </tag>
    </tags>
</filterLog>
```

6.3.1.2 Response

```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
    <filterLogResults xmlns="http://www.cisco.com/esc/esc">
        <log_level>INFO</log_level>
        <logs>
            <classifications>
                <classification>OS</classification>
                <classification>SM</classification>
            </classifications>
            <tags>
                <tag>
                    <name>depName</name>
                    <value>CSR_ap1</value>
                </tag>
                <tag>
                    <name>tenant</name>
                    <value>admin</value>
                </tag>
```

```
                </tags>
                <log_date_time>13:06:07,575 31-Oct-2016</log_date_time>
                <log_message> No pending work flow to start.</log_message>
            </logs>
        </filterLogResults>
</rpc-reply>
```

7   ESC Triggered Workflows

7.1   Auto Recovery (Auto Healing) Workflow

A VM recovery is triggered in the following scenarios.
- During a service deployment if VM_ALIVE event from any or all of the VMs being deployed by the service is not received before the timeout value.
- After the service is deployed, if any of the VMs deployed goes down for some reason and there are rules defined to activate VM recovery for these cases.

Recovery Initialize
When a VM recovery is triggered, an escEvent of type **VM_RECOVERY_INIT** with a status of **SUCCESS** will be sent to Netconf subscribers. This indicates that the recovery workflow has been started. This will hard reboot the VM instance and checks if the VM comes back up.
If the VM comes up successfully, an escEvent of type **VM_RECOVERY_COMPLETE** with a status of **SUCCESS** with be sent.

Attempts for recovery
If the VM did not come up after this attempt, then ESC tries to undeploy and redeploy the VM and corresponding escEvent of type **VM_RECOVERY_UNDEPLOYED** and **VM_RECOVERY_DEPLOYED** will be sent. If the undeploy and redeploy also fails to get the VM back up, this undeploy and redeploy cycle will be retried to a maximum value of "vm_recovery_retries_max" times which is configurable.

Recovery complete
If the VM comes alive at any attempt during the undeploy and deploy, an escEvent of type **VM_RECOVERY_COMPLETE** with a status of **SUCCESS** with be sent. But if the VM does not come up after all the redeploy attempts, then an escEvent of type **VM_RECOVERY_COMPLETE** with a status of **FAILURE** will be sent.
The various event notifications generated during VM recovery are given below.

Success Event notifications
```
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-04-28T23:38:45.107+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Recovery event for VM [csr-reg_12605_vnf-tenant_vnf-tenantcsr-
depcsr-reg1.2_0_csr-vm_0] triggered. Processing Auto healing. Proceeding with
Recovery.</status_message>
    <depname>csr-dep</depname>
    <tenant>vnf-tenant</tenant>
    <depid>3e0d269a-c3a4-454a-832f-44e0528ed2c1</depid>
    <vm_group>csr-vm</vm_group>
    <vm_source>
      <vmid>9b252ece-7973-4b1f-832e-fe53c68fb963</vmid>
```

```
      <hostid>a2f7615e78330dd28697588ddfb9516504b19642f53d39d7cff4f6ab</hostid>
    </vm_source>
    <vm_target/>
    <event>
       <type>VM_RECOVERY_INIT</type>
    </event>
  </escEvent>
</notification>


<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-04-28T23:38:52.073+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM [csr-reg__12605__vnf-tenant__vnf-tenantcsr-depcsr-
reg1.2__0__csr-vm__0] has been undeployed.</status_message>
    <depname>csr-dep</depname>
    <tenant>vnf-tenant</tenant>
    <depid>3e0d269a-c3a4-454a-832f-44e0528ed2c1</depid>
    <vm_group>csr-vm</vm_group>
    <vm_source>
       <vmid>9b252ece-7973-4b1f-832e-fe53c68fb963</vmid>
       <hostid>a2f7615e78330dd28697588ddfb9516504b19642f53d39d7cff4f6ab</hostid>
    </vm_source>
    <vm_target/>
    <event>
       <type>VM_RECOVERY_UNDEPLOYED</type>
    </event>
  </escEvent>
</notification>


<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-04-28T23:39:03.36+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM [csr-reg__12605__vnf-tenant__vnf-tenantcsr-depcsr-
reg1.2__0__csr-vm__0] has been deployed as part of recovery.</status_message>
    <depname>csr-dep</depname>
    <tenant>vnf-tenant</tenant>
    <depid>3e0d269a-c3a4-454a-832f-44e0528ed2c1</depid>
    <vm_group>csr-vm</vm_group>
    <vm_source>
       <vmid>9b252ece-7973-4b1f-832e-fe53c68fb963</vmid>
       <hostid>a2f7615e78330dd28697588ddfb9516504b19642f53d39d7cff4f6ab</hostid>
    </vm_source>
    <vm_target>
       <vmid>250e515b-978f-4358-b455-124b72608ba2</vmid>
       <hostid>a2f7615e78330dd28697588ddfb9516504b19642f53d39d7cff4f6ab</hostid>
    </vm_target>
    <event>
       <type>VM_RECOVERY_DEPLOYED</type>
    </event>
  </escEvent>
</notification>


<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-04-28T23:39:21.125+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>Successfully recovered VM [csr-reg__12605__vnf-tenant__vnf-
tenantcsr-depcsr-reg1.2__0__csr-vm__0].</status_message>
    <depname>csr-dep</depname>
    <tenant>vnf-tenant</tenant>
    <depid>3e0d269a-c3a4-454a-832f-44e0528ed2c1</depid>
    <vm_group>csr-vm</vm_group>
    <vm_source>
       <vmid>9b252ece-7973-4b1f-832e-fe53c68fb963</vmid>
       <hostid>a2f7615e78330dd28697588ddfb9516504b19642f53d39d7cff4f6ab</hostid>
```

```
        </vm_source>
        <vm_target>
          <vmid>250e515b-978f-4358-b455-124b72608ba2</vmid>
          <hostid>a2f7615e78330dd28697588ddfb9516504b19642f53d39d7cff4f6ab</hostid>
        </vm_target>
        <event>
          <type>VM_RECOVERY_COMPLETE</type>
        </event>
      </escEvent>
</notification>
```

On Failure:

Event notification

An escEvent of type **VM_RECOVERY_COMPLETE** with a status of **FAILURE** will be sent to Netconf
subscribers if the recovery workflow results in a failure. If a FAILURE event occurs, there may be cleanup
required as described below under *Handling Recovery Failures*.

Handling Recovery Failures

If a **failure** occurs while attempting a recovery, the Netconf client should explicitly bring the
configuration back to a consistent state by sending the corresponding Undeploy service configuration
change. Refer to section 6.1.11 for Undeploy service configuration. The Undeploy would send escEvents
of type VM_UNDEPLOYED , DELETE_SUBNET (if any subnets were created during deployment) ,
DELETE_NETWORK (if any networks were created during deployment) and SERVICE_UNDEPLOYED . The
Deploy service configuration change can then be retried explicitly by the Netconf client once the
underlying issue is resolved. Refer to section 6.1.9 for Deploy service configuration.

7.2   Scale Out/Scale in Work Flows

7.2.1   Scale Out Work Flow

A scale-out work flow will be triggered if the current VNF is overloaded. From the user side, no request
is required to trigger a scale-out. The monitors attached to a VNF will trigger it if necessary.

7.2.1.1   Event Notifications

```
        There are three notifications sent to NB during a successful scale out:

        1. When a scale-out work flow is initiated, the following notifications will be
        sent from ESC:

        <?xml version="1.0" encoding="UTF-8"?>
        <notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
          <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
          <escEvent xmlns="http://www.cisco.com/esc/esc">
            <status>SUCCESS</status>
            <status_message>VM scale out triggered</status_message>
            <depname>dep</depname>
            <tenant>hezh-yesc-0520</tenant>
            <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
            <vm_group>CSR</vm_group>
            <vm_source>
              <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
              <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
            </vm_source>
            <vm_target>
          </vm_target>
            <event>
              <type>VM_SCALE_OUT_INIT</type>
            </event>
```

```
      </escEvent>
  </notification>

2. The scale-out deploys a new VM. When the new VM is deployed, a notification
will be sent:

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM deployed</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>VM_SCALE_OUT_DEPLOYED</type>
    </event>
  </escEvent>
</notification>

3. When the VM is alive, the final notification will be sent:

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM scaled out successfully</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
  </vm_target>
    <event>
      <type>VM_SCALE_OUT_COMPLETE</type>
    </event>
  </escEvent>
</notification>

If there are errors during scaling out, a notification indicating the failure
will be sent:

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>FAILURE</status>
    <status_message>VM scaled out failed</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
```

```
        </vm_target>
        <event>
          <type>VM_SCALE_OUT_COMPLETE</type>
        </event>
      </escEvent>
    </notification>
```

7.2.2   Scale In Work Flow

A scale-in work flow will be triggered if the current VNF is underloaded. From the user side, no request is required to trigger a scale-in. The monitors attached to a VNF will trigger it if necessary.

7.2.2.1   Event Notifications

```
There are two notifications sent to NB during a successful scale in:

1. When a scale-in work flow is initiated, the following notifications will be
sent from ESC:

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM scale in triggered</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>VM_SCALE_IN_INIT</type>
    </event>
  </escEvent>
</notification>

3. When the VM is undeployed, the final notification will be sent:

<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>SUCCESS</status>
    <status_message>VM scaled in successfully</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
      <hostname>my-ucs-5</hostname>
    </vm_source>
    <vm_target>
  </vm_target>
    <event>
      <type>VM_SCALE_IN_COMPLETE</type>
    </event>
  </escEvent>
</notification>

If there are errors during scaling in, a notification indicating the failure
will be sent:
```

```xml
<?xml version="1.0" encoding="UTF-8"?>
<notification xmlns="urn:ietf:params:xml:ns:netconf:notification:1.0">
  <eventTime>2015-05-19T23:46:36.276+00:00</eventTime>
  <escEvent xmlns="http://www.cisco.com/esc/esc">
    <status>FAILURE</status>
    <status_message>VM scaled in failed</status_message>
    <depname>dep</depname>
    <tenant>hezh-yesc-0520</tenant>
    <depid>187bc0b5-9d0b-4c01-8353-89454a6a1da6</depid>
    <vm_group>CSR</vm_group>
    <vm_source>
      <vmid>5283bcab-c1c3-4699-9bbe-cf143b26c6aa</vmid>
      <hostid>c64e652a4561392ae20ae702eceae53e417302e0d2d63e41d66a15cc</hostid>
    </vm_source>
    <vm_target>
    </vm_target>
    <event>
      <type>VM_SCALE_IN_COMPLETE</type>
    </event>
  </escEvent>
</notification>
```

8   Import Workflows Using Netconf

8.1   Import VM Configuration

In ESC 5.1 or later, when importing a VM into ESC, its VIM settings must be pre-loaded into ESC. Once configuration data is pre-loaded, then the associated deployment can be performed. The association between the import configuration and the deployment is uniquely identified by the project and deployment name.

8.1.1   Netconf Request

```xml
<importDeploymentData xmlns="http://www.cisco.com/esc/esc">
    <action_type>CREATE</action_type>
    <project_name>SampleProjectName</project_name>
    <deployment_name>SampleDepName</deployment_name>
    <payload_path>/tmp/existing_vms.xml</payload_path>
</importDeploymentData>
```

The "payload_path" option in the request is a fully qualified path to a file that contains all the necessary VIM settings.

8.1.1.1   Import File Sample

```xml
<import>
    <vms>
        <vm_details> <!--First VM details-->
            <flavor/>
            <host/>
            <host_id/>
            <image/>
            <port/>
            <uuid>1bb008e1-d4dd-4107-bc45-7e298a5ac510</uuid>
            <name>SampleVMName</name>
            <attached_volume/>
        </vm_details>
        <vm_details>
        ........ <!--add more vms using vm_details tag-->
        </vm_details>
    </vms>
    <deployment_name>SampleDepName</deployment_name>
    <project_name>SampleProjectName</project_name>
    <project_uuid>563fba7044c847a6a370cc10d5ef7d57</project_uuid>
```

```
        </import>
```

8.1.2   Netconf Response
```
<?xml version="1.0" encoding="UTF-8"?>
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <imported_data xmlns="http://www.cisco.com/esc/esc">
    <import>
      <deployment_name>SampleDepName</deployment_name>
      <project_name>SampleProjectName</project_name>
      <project_uuid>52c7cb4979924fd28bb95480bf7bdd45</project_uuid>
      <vms>
        <vm_details>
          <flavor/>
          <host/>
          <host_id/>
          <image/>
          <metadata>
            <configuration/>
          </metadata>
          <port>
            <port_security_enabled>false</port_security_enabled>
          </port>
          <uuid>b2715fd2-532b-42f2-8c2f-b12cb5edb66a</uuid>
          <name>SampleVMName</name>
          <attached_volume/>
        </vm_details>
      </vms>
    </import>
  </imported_data>
</rpc-reply>
```

8.2   Finalize VM Import Configuration

In ESC 5.1 or later, once the import is deemed successful, the import is finalized. The finalize step is done after the associated deployment is deemed successful. Once in finalized stage, this stage cannot be reversed.

8.2.1   Netconf Request
```
<importDeploymentData xmlns="http://www.cisco.com/esc/esc">
    <action_type>FINALIZE</action_type>
    <project_name>SampleProjectName</project_name>
    <deployment_name>SampleDepName</deployment_name>
</importDeploymentData>
```

8.2.2   Netconf Response
```
<?xml version="1.0" encoding="UTF-8"?>
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <imported_data xmlns="http://www.cisco.com/esc/esc">
    <import>
      <deployment_name>SampleDepName</deployment_name>
      <project_name>SampleProjectName</project_name>
      <project_uuid>52c7cb4979924fd28bb95480bf7bdd45</project_uuid>
      <vms>
        <vm_details>
          <flavor/>
          <host/>
          <host_id/>
          <image/>
          <metadata>
            <configuration/>
          </metadata>
          <port>
            <port_security_enabled>false</port_security_enabled>
          </port>
          <uuid>b2715fd2-532b-42f2-8c2f-b12cb5edb66a</uuid>
```

```
            <name>SampleVMName</name>
            <attached_volume/>
          </vm_details>
        </vms>
      </import>
    </imported_data>
  </rpc-reply>
```

8.3   Delete VM Import Configuration

In ESC 5.1 or later, if VM was imported into ESC, once the associated deployment is undeployed, it is highly recommended to also delete the matching import configuration. Import configuration cannot be deleted will the associated deployment is still in ESC.

8.3.1   Netconf Request

```
<importDeploymentData xmlns="http://www.cisco.com/esc/esc">
    <action_type>DELETE</action_type>
    <project_name>SampleProjectName</project_name>
    <deployment_name>SampleDepName</deployment_name>
</importDeploymentData>
```

8.3.2   Netconf Response

```
<?xml version="1.0" encoding="UTF-8"?>
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <imported_data xmlns="http://www.cisco.com/esc/esc">
    <import>
      <deployment_name>SampleDepName</deployment_name>
      <project_name>SampleProjectName</project_name>
      <project_uuid>52c7cb4979924fd28bb95480bf7bdd45</project_uuid>
      <vms>
        <vm_details>
          <flavor/>
          <host/>
          <host_id/>
          <image/>
          <metadata>
             <configuration/>
          </metadata>
          <port>
             <port_security_enabled>false</port_security_enabled>
          </port>
          <uuid>b2715fd2-532b-42f2-8c2f-b12cb5edb66a</uuid>
          <name>SampleVMName</name>
          <attached_volume/>
        </vm_details>
      </vms>
    </import>
  </imported_data>
</rpc-reply>
```

8.4   Get VM Import Configuration

In ESC 5.1 or later, it is possible to view the import configuration for a particular deployment if it exist.

8.4.1   NetConf Request

```
<importDeploymentData xmlns="http://www.cisco.com/esc/esc">
    <action_type>GET</action_type>
    <project_name>SampleProjectName</project_name>
    <deployment_name>SampleDepName</deployment_name>
</importDeploymentData>
```

8.4.2　Netconf Response

```xml
<?xml version="1.0" encoding="UTF-8"?>
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <imported_data xmlns="http://www.cisco.com/esc/esc">
    <import>
      <deployment_name>SampleDepName</deployment_name>
      <project_name>SampleProjectName</project_name>
      <project_uuid>52c7cb4979924fd28bb95480bf7bdd45</project_uuid>
      <vms>
        <vm_details>
          <flavor/>
          <host/>
          <host_id/>
          <image/>
          <metadata>
            <configuration/>
          </metadata>
          <port>
            <port_security_enabled>false</port_security_enabled>
          </port>
          <uuid>b2715fd2-532b-42f2-8c2f-b12cb5edb66a</uuid>
          <name>SampleVMName</name>
          <attached_volume/>
        </vm_details>
      </vms>
    </import>
  </imported_data>
</rpc-reply>
```