Elastic Services Controller Interfaces

Cisco Elastic Services Controller (ESC) can be deployed in one of the following ways:

- As part of the Cisco Orchestration suite—ESC is packaged with Cisco Network Service Orchestrator (NSO), and available within Cisco Solutions such as Virtually Managed Services (vMS) and Cisco Intercloud Services (CIS).
- As a standalone product, ESC is available as a VNFM bundled with Cisco VNFs such as VPN, vRouter, vSecurity and many others.

When ESC is deployed as a part of the vMS, CIS, VPN, vRouter and so on, these applications interface with ESC through the Northbound APIs. ESC supports both REST and NETCONF northbound interfaces for operations and transactions. In addition, in ESC 2.0 onwards, the ESC portal supports CRUD operations for some of the task for Virtual Network Function lifecycle management.

This chapter contains information about the Northbound APIs and the ESC portal.

- Elastic Services Controller NB APIs, page 1
- Cisco Elastic Services Controller Portal, page 4

Elastic Services Controller NB APIs

Elastic Services Controller (ESC) supports REST and NETCONF northbound interfaces for operations and transactions. The northbound interfaces interact with the NB client, NSO or any OSS. For REST interface interactions, callbacks are triggered, and for NETCONF/YANG interface interactions, NETCONF notifications are triggered.

NETCONF/YANG Northbound API

ESC uses NETCONF to configure and manage the network and its devices. NETCONF is a network management protocol to install, manipulate, operate and delete the configuration of network devices. Cisco NSO communicates with ESC using the open NETCONF protocol and YANG based data models. ESC manages Virtual Network Functions at a device level, and NSO manages the entire network service lifecycle. Together, they make it a complete orchestration solution that spans across both physical and virtual infrastructure.
ConfD enables integration with NSO by adding NETCONF/YANG northbound interface support. Along with NETCONF notifications, the NETCONF/YANG model also provides operational data. You can run queries to get details such as list of all tenants, networks, and deployments in ESC.

**Important**

Starting from ESC Release 2.1, you can create a single NETCONF request to perform multiple actions. The following is a NETCONF request to delete two tenants and subnets or networks simultaneously:

```xml
<esc_datamodel xmlns="http://www.cisco.com/esc/esc">
  <tenants>
    <tenant nc:operation="delete">
      <name>hezh-mix-tenant1</name>
    </tenant>
    <tenant nc:operation="delete">
      <name>hezh-mix-tenant2</name>
    </tenant>
  </tenants>
</esc_datamodel>
```

Examples of NETCONF/YANG API are as follows:

**NETCONF request to create a Tenant,**

```xml
<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>
```

An escEvent of type CREATE_TENANT with a status of SUCCESS is sent to NETCONF subscribers once the configuration activation is completed. This indicates that the activation workflow is complete and the configuration resource is successfully created in the VIM.

**NETCONF notification after a tenant is successfully created:**

```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>
```

The operational data (Opdata) for the tenant shows the name and 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,
<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>
For more details on series of notifications, event failure notifications, and Opdata, see the Cisco Elastic Services Controller API Guide.

REST Northbound API

The REST API is a programmatic interface to the ESC that uses a Representational State Transfer (REST) architecture. The API accepts and returns HTTP or HTTPS messages that contain JavaScript Object Notation (JSON) or Extensible Markup Language (XML) documents. You can use any programming language to generate the messages and the JSON or XML documents that contain the API methods or managed object (MO) descriptions.

The API model includes these programmatic entities:

- **Classes**—Templates that define the properties and states of objects in the management information tree.
- **Methods**—Actions that the API performs on one or more objects.
- **Types**—Object properties that map values to the object state (for example, equipmentPresence).

A typical request comes into the ESC and is placed in the transactor queue in first in, first out (FIFO) order. The transactor gets the request from the queue, interprets the request, and performs an authorization check. After the request is confirmed, the transactor updates the MIT. This complete operation is done in a single transaction.

For detailed reference information about API classes, properties, and data types, see the Cisco Elastic Services Controller API Guide.

Example of REST APIs

To create a tenant using REST:

```
POST /v0/tenants/123 HTTP/1.1
Host: client.host.com
Content-Type: application/xml
Accept: application/xml
Client-Transaction-Id: 123456
Callback:/createtenantcallback

<tenant xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <name>Elie</name>
  <enabled>true</enabled>
  <description>A description...</description>
</tenant>
```
REST response after a tenant is successfully created:

HTTP/1.1 201 OK
Content-Type: application/xml; charset=UTF-8
Content-Length: 200
Date: Sun, 1 Jan 2011 9:00:00 GMT
ESC-Transaction-Id: 123456
ESC-Status-Code: 200
ESC-Status-Message: Success ...

<?xml version="1.0" encoding="UTF-8"?>
<tenant>
<external_tenant_id>23423490854004</external_tenant_id>
<internal_tenant_id>434344896854965</internal_tenant_id>
<name>Elie</name>
<enabled>true</enabled>
<description>A description...</description>
</tenant>

For more details on response callback, request parameters, see the Cisco Elastic Services Controller API Guide.

Note: Further in this document, examples for scenarios will be provided either using REST or NETCONF/YANG, but not both.

Cisco Elastic Services Controller Portal

The ESC portal is a simplified Web-based tool for an ESC administrator to create, read, update, or delete (CRUD) operations related to VNF lifecycle management. As an administrator you can create and view the real-time activities of ESC such as deploying, undeploying, healing and scaling.

The ESC portal is enabled by default while creating an ESC VM either in an OpenStack or VMWare environment. For more information on enabling or disabling the ESC portal, see Cisco Elastic Services Controller Install and Upgrade Guide.

To start, stop and check the status of the ESC UI, do the following:

1. Connect to ESC using SSH:
   `ssh user-name@ip-address-of-esc-vm`

2. Switch to the root user:
   `sudo su`

3. To check the ESC UI process status:
   `status esc_ui`

4. To start ESC UI, run `start esc_ui`

5. To stop ESC UI, run `stop esc_ui`

6. To restart ESC UI, run `restart esc_ui`

ESC UI limitations are listed under Limitations section in the Elastic Services Controller Release Notes.

Logging into the Web Portal

The ESC portal provides default admin access. admin can create new users, and assign privileges to them. User profiles can also be updated in the UI.
1 Using your web browser, enter the IP address of ESC and port number:
   • Login via HTTP: http://esc-mgmt-ip:9000
   • Login via HTTPS: https://esc-mgmt-ip:9001

2 Enter the username and password, and login to the portal.

For more details on port, and browser requirements see the Cisco Elastic Services Controller Install and Upgrade Guide

**Getting Started with ESC Portal**

Table below lists the details users can view in the portal:

*Note* These tasks can also be performed using the NB APIs. See the Elastic Services Controller NB APIs, on page 1 for more details.

**Table 1: Portal Details**

<table>
<thead>
<tr>
<th>Task</th>
<th>Navigate</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>To view Dashboard</td>
<td>Go to Dashboard</td>
<td>View the summary of all the managed ESC resources, infrastructure, notifications, and the system health.</td>
</tr>
<tr>
<td>Task</td>
<td>Navigate</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>To view existing deployments</td>
<td><strong>OpenStack</strong></td>
<td>Shows all the deployed VMs, and VM groups and their status.</td>
</tr>
<tr>
<td></td>
<td>Go to <strong>Deployments</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To view further details, click <strong>Actions</strong> and then <strong>View VNFs</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Select the KPI Data tab to view the monitoring details.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Select the Rules tab to view the admin rules and actions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Select the Scaling tab to view scaling details.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>VMware</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Go to <strong>Deployments</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To view further details, click <strong>Actions</strong> and then <strong>View VNFs</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• Select the Scaling tab to view scaling details.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To start, stop, reboot and enable or disable monitoring for a specific VM, click <strong>Actions</strong> and then select the corresponding action.</td>
<td></td>
</tr>
<tr>
<td>To view tenants</td>
<td>Go to <strong>Resources &gt; Tenants</strong></td>
<td>Provides a list of tenants, name, description and tenant ID.</td>
</tr>
<tr>
<td></td>
<td><strong>Important</strong> Tenant administrators will be used for all deployments in VMware. ESC does not support multi-tenancy in the VMware environment.</td>
<td></td>
</tr>
<tr>
<td>Task</td>
<td>Navigate</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>To view networks, sub-networks and interfaces</td>
<td>Go to Resources &gt; Networks</td>
<td>Details of Network, Sub-network and Interfaces are available on different tabs. You can find details such as name, network ID, tenant ID and so on for each of them. Note Sub-network and Interfaces tabs are available only on Openstack environment.</td>
</tr>
<tr>
<td>To view VNF Images</td>
<td>Go to Resources &gt; Images</td>
<td>Provides list of images for the selected resources details.</td>
</tr>
<tr>
<td>To view VNF deployment flavors</td>
<td>Go to Resources &gt; Flavors</td>
<td>Provides list of flavors for the selected resources. Note Flavors is available only on Openstack based ESC VMs.</td>
</tr>
<tr>
<td>To view the switch details (VMware only)</td>
<td>Go to Resources &gt; Switches</td>
<td>Provides a list of switches, name, description, UUID and hosts.</td>
</tr>
<tr>
<td>To view logs</td>
<td>Go to System &gt; Log</td>
<td>You will find real-time logs for ESC events throughout VNF lifecycle. In the Setting page, you can filter error, trace, warning, thread activities, rest calls, database, transitions, OpenStack driver and timer messages. Displays real-time logs for ESC events, such as messages from the external systems, messages from ESC to external systems, and some key events such as spin up, spin down, failures and services. To view settings, Click the gear icon at the top right corner.</td>
</tr>
<tr>
<td>To view incoming requests to ESC</td>
<td>Go to System &gt; Incoming Requests</td>
<td>Lists all the incoming requests to ESC such as Transaction ID and request details.</td>
</tr>
<tr>
<td>To view configurations</td>
<td>Go to System &gt; Configuration</td>
<td>Lists all the configuration parameters used for ESC, and configuration details of VMs, Day-0 configuration and monitoring rules. Shows dynamic information on the CPU usage, and memory utilization.</td>
</tr>
<tr>
<td>Task</td>
<td>Navigate</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>To view boot parameters (OpenStack only)</td>
<td>Go to <strong>System &gt; Boot Parameters</strong></td>
<td>Lists all the boot parameters used to boot ESC.</td>
</tr>
<tr>
<td>To view host details (OpenStack only)</td>
<td>Go to <strong>System &gt; Host details</strong></td>
<td>Lists the host details such as Operating System (OS), version of the OS, System up time, RAM, Storage and other details.</td>
</tr>
<tr>
<td>To view the health of ESC (OpenStack only)</td>
<td>Go to <strong>System &gt; Health</strong></td>
<td>Show the health of ESC, Confd status, Operational status and other details.</td>
</tr>
<tr>
<td>To view the infrastructure details (OpenStack only)</td>
<td>Go to <strong>Infrastructure &gt; Instances</strong></td>
<td>All VMs running on the virtualization infrastructure.</td>
</tr>
<tr>
<td>To view the Hypervisors (OpenStack only)</td>
<td>Go to <strong>Infrastructure &gt; Hypervisors</strong></td>
<td>All hypervisors running on the virtualization infrastructure.</td>
</tr>
<tr>
<td>To deploy a VNF</td>
<td>• Go to <strong>Deployments</strong></td>
<td>Deploys a VNF.</td>
</tr>
<tr>
<td></td>
<td>• Click New Deployment</td>
<td>The drag and drop feature allows you to grab an existing deployment datamodel and to re-use it by dragging the file to the drop off area.</td>
</tr>
<tr>
<td></td>
<td>• Select Deploy from a file</td>
<td><strong>Note</strong> Only xml files are accepted.</td>
</tr>
<tr>
<td></td>
<td>• Click <strong>Drop File Here</strong> and locate the file or, Drag and drop your file to the <strong>Drop File Here</strong> area</td>
<td>The drag and drop feature executes a REST call as of now and does not execute NETCONF calls.</td>
</tr>
<tr>
<td></td>
<td><strong>Important</strong> To deploy a VNF in the VMWare environment using a form, see the <strong>Deploying Using a Form</strong>.</td>
<td></td>
</tr>
<tr>
<td>To un-deploy</td>
<td>• Go to <strong>Deployments</strong></td>
<td>Un-deploys VNF(s).</td>
</tr>
<tr>
<td></td>
<td>• Click Actions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Click Un-deploy</td>
<td></td>
</tr>
<tr>
<td>To view VDC</td>
<td>Choose <strong>Resources &gt; Datacenters</strong></td>
<td>View list of all Virtual Datacenters.</td>
</tr>
</tbody>
</table>
Cisco Elastic Services Controller Portal Dashboard

The Cisco Elastic Services Controller dashboard provides a tabular representation of all the managed ESC resources, deployments, infrastructure, incoming requests, notifications, and visual indicators of system health. The following dashboard elements helps you to track, diagnose, monitor data over time and the system health.

- Resources
- Deployments
- Infrastructure
- Incoming Requests
- Notifications
- System

The dashboard is best used in a monitoring desk context, where the system displaying the dashboard is dedicated for that purpose and might be distinct from the systems running the protocol servers. The dashboard system should point its browser to the system running the protocol servers.

If you notice unusual spikes or drops in activity, there could be communication failures or power outages on the network that you need to investigate.

Resources

The Resources dashboard displays information related to ESC portal managed (in-band) resources. You can view the active VMs count, VMs deploying count, Error VMs count, count status of Tenants, Images, Flavors, and Networks.

Deployments

The Deployments dashboard displays a high level summary of VNFs that is currently being deployed. You can view the name and status of the VNF, and the number of VMs that are deployed in the VNF.

Infrastructure

The Infrastructure dashboard displays information about the virtual infrastructure, the status and IP address of the VIM.

Incoming Requests

The Incoming Requests dashboard displays the requested action, callback URL from where the request action was performed, the type of incoming request and the time when the request was sent. ESC integrates with other applications through Northbound APIs (both REST and NETCONF) to list incoming request details.

Notifications

The Notifications dashboard displays only notifications received on the Portal from ESC.
Systems

The System dashboard element displays the tabular and graphical representation of the platform's performance data. It also displays components health of the selected resources.