



# Configuring Cisco Cloud Network Controller Components

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- [About Configuring the Cisco Cloud Network Controller, on page 1](#)
- [Configuring the Cisco Cloud Network Controller Using the GUI, on page 1](#)
- [Configuring Cisco Cloud Network Controller Using the REST API, on page 63](#)

## About Configuring the Cisco Cloud Network Controller

You create the Cisco Cloud Network Controller components using either the Cisco Cloud Network Controller GUI or the REST API. This section explains how to create configuration, application management, operations, and administrative components.



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**Note** For information about the GUI, such as navigation and a list of configurable components, see [About the Cisco Cloud Network Controller GUI](#).

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## Configuring the Cisco Cloud Network Controller Using the GUI

### Creating a Tenant

The following sections describe how to create a managed tenant or unmanaged tenant.

### Setting Up the Google Cloud Project for a User Tenant

Perform the procedures in this section to set up the Google Cloud project for a user tenant, where that user tenant is either a managed or an unmanaged tenant.

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**Step 1** Create a Google Cloud project for the user tenant, if necessary.

Each user tenant is mapped one-to-one to a Google Cloud project. If you do not have a Google Cloud project created yet for your user tenant, follow these procedures to create a Google Cloud project.

**Note** Beginning with 26.0(2), support is now available for having multiple cloud projects under a single user tenant. For more information, see [Tenants](#).

- a) Log into your Google account.
- b) Navigate to **IAM & Admin > Manage resources**.
- c) Using the **Select organization** drop-down list at the top of the page, choose the organization where you want to create a project.
- d) Click + **CREATE PROJECT**.
- e) In the **New Project** window that appears, enter a project name and select a billing account as applicable.

A project name can contain only letters, numbers, single quotes, hyphens, spaces, or exclamation points, and must be between 4 and 30 characters.

- f) Enter the parent organization or folder in the **Location** field.  
That resource will be the hierarchical parent of the new project.
- g) Click **CREATE**.

**Step 2** In Google Cloud, enable the appropriate service APIs in the service account associated with this user tenant.

- a) In the Google Cloud GUI, log into the Google Cloud project that is associated with this user tenant. The **Dashboard** for the project is displayed.
- b) In the search bar at the top of the **Dashboard**, search for **APIs & Services**, then click the result from that search to access the **APIs & Services** window.
- c) In the **APIs & Services** window, click the + **ENABLE APIS AND SERVICES** tab.

The **API Library** window appears.

- d) In the **Search for APIs & Services** field, search for and enable the necessary services.

For each of the services in the list below:

1. Search for the API or service in the **Search for APIs & Services** field.
2. Click on the search result to display the page for that API or service.
3. Click the **ENABLE** button in that API or service page.

Following are the APIs and services that you must search for and enable:

- Compute Engine API
- Cloud Deployment Manager V2 API
- Cloud Pub/Sub API
- Cloud Resource Manager API
- Service Usage API
- Cloud Logging API

Each API or service takes several minutes to enable. You will have to navigate back to the **APIs & Services** window after you enable each API or service.

Note that the following additional APIs and services should be enabled automatically when you enable all of the APIs and services listed above:

- Identity and Access Management (IAM) API

- IAM Service Account Credentials API
- Cloud OS Login API
- Cloud DNS API
- Recommender API

If they are not enabled automatically, enable them manually.

### Step 3

Set the necessary permissions for this user tenant in Google Cloud.

- a) In the Google Cloud GUI, log into the Google Cloud project that is associated with this user tenant. The **Dashboard** for the project is displayed.
- b) In the left nav bar, click on **IAM & Admin**, then choose **IAM**.  
The **IAM** window appears with several service accounts displayed.
- c) Locate the appropriate service account.
- d) Set the permissions for this service account.

1. Click the pencil icon on the row for this service account.

The **Edit Permissions** window is displayed.

2. Click + **ADD ANOTHER ROLE**, then choose **Editor** as the role.

You are returned to the **IAM** window with the service accounts displayed.

3. Click + **ADD ANOTHER ROLE** again, then add the remaining necessary roles for this service account.

Following is the full list of roles that you must assign to this service account, including the Cloud Functions Service Agent that you added in the first step of this process:

- Editor
- Role Admin
- Project IAM Admin

4. After you have added all the necessary roles, click **SAVE**.

You are returned to the **IAM** window with the service accounts displayed and the necessary roles assigned to this service account.

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## Creating a Managed Tenant

The following sections provide the information that you'll need to create a managed tenant, where you will:

- Create a managed tenant in Cisco Cloud Network Controller
- Set the necessary permissions for the managed tenant in Google Cloud

## Creating a Managed Tenant Using the Cisco Cloud Network Controller GUI

This section explains how to create a tenant that will be managed by Cisco Cloud Network Controller using the GUI.

- Step 1** Set up the Google Cloud project for the user tenant.  
See [Setting Up the Google Cloud Project for a User Tenant, on page 1](#) for those procedures.
- Step 2** In the Cisco Cloud Network Controller GUI, navigate to **Application Management > Tenants**.  
A table of already-configured tenants is displayed.
- Step 3** Click **Actions** and choose **Create Tenant**.  
The **Create Tenant** dialog box appears.
- Step 4** Choose the appropriate options and enter the appropriate values in each field as listed in the following *Create Tenant Dialog Box Fields* table then continue.

**Table 1: Create Tenant Dialog Box Fields**

Properties	Description
<b>Name</b>	Enter the name of the tenant. Match the regular expression:  [a-z]([-a-z0-9]*[a-z0-9])?  This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.
<b>Description</b>	Enter a description of the tenant.
<b>Settings</b>	
<b>Add Security Domain</b>	To add a security domain for the tenant:  <ol style="list-style-type: none"> <li>Click <b>Add Security Domain</b>. The <b>Select Security Domains</b> dialog appears with a list of security domains in the left pane.</li> <li>Click to choose a security domain.</li> <li>Click <b>Select</b> to add the security domain to the tenant.</li> </ol>
<b>Google Cloud Project</b>	
<b>Default Project</b>	Select a default Google cloud Project.

Properties	Description
<b>Google Cloud Project</b>	<p>Beginning with 26.0(2), you can now add multiple Google Cloud projects under a single tenant. Click Add Account to enter the Google Project ID. You can also check the box to set this account as a default account. Enter the name for the project.</p> <p><b>Note</b> You can only select one account as default.</p> <ul style="list-style-type: none"> <li>Choose an access type: For a tenant that will be managed by the Cisco Cloud Network Controller, choose <b>Managed Identity</b> as the access type. For more information, see <a href="#">Understanding Google Cloud Deployments with Cisco Cloud Network Controller</a>.</li> <li>To add a security domain for the account: <ul style="list-style-type: none"> <li><b>Note</b> Adding a security domain for Google Cloud is optional when creating a tenant.</li> <ol style="list-style-type: none"> <li>Click <b>Add Security Domain for Google Cloud Project</b>. The <b>Select Security Domains</b> dialog appears with a list of security domains in the left pane.</li> <li>Click to choose a security domain.</li> <li>Click <b>Select</b> to add the security domain to the tenant.</li> </ol> </ul></li> </ul>

**Step 5** Click **Save** when finished.

### What to do next

Complete the necessary configurations in Google Cloud for the managed tenant. Go to [Setting the Necessary Permissions in Google Cloud for a Managed Tenant, on page 5](#) for those procedures.

### Setting the Necessary Permissions in Google Cloud for a Managed Tenant

If you are creating a managed tenant, you must now set the necessary permissions in Google Cloud.



**Note** You do not have to follow the steps in this procedure if you are creating an unmanaged tenant.

**Step 1** In the Google Cloud GUI, log into the Google Cloud project that is associated with this managed tenant. The **Dashboard** for the project is displayed.

**Step 2** In the left nav bar, click on **IAM & Admin**, then choose **IAM**. The **IAM** window appears with several service accounts displayed.

**Step 3** Locate the service account that was created in the project that is associated with the infra account.

**Step 4** Copy the service account name.

**Step 5** Add this service account name as an IAM user in the user tenant project.

**Step 6** Set the permissions for this service account.

a) Click the pencil icon on the row for this service account.

The **Edit Permissions** window is displayed.

b) Click + **ADD ANOTHER ROLE**, then choose **Cloud Functions Service Agent** as the role.

You are returned to the **IAM** window with the service accounts displayed.

c) Click + **ADD ANOTHER ROLE** again, then add the remaining necessary roles for this service account.

Following is the full list of roles that you must assign to this service account, including the Cloud Functions Service Agent that you added in the first step of this process:

- Cloud Functions Service Agent
- Compute Instance Admin (v1)
- Compute Network Admin
- Compute Security Admin
- Logging Admin
- Pub/Sub Admin
- Storage Admin

d) After you have added all the necessary roles, click **SAVE**.

You are returned to the **IAM** window with the service accounts displayed and the necessary roles assigned to this service account.

## Creating an Unmanaged Tenant

The following sections provide the information that you'll need to create an unmanaged tenant, where you will:

- Generate and download the necessary private key information from Google Cloud for an unmanaged tenant
- Create an unmanaged tenant in Cisco Cloud Network Controller

### Generating and Downloading Private Key Information from Google Cloud for an Unmanaged Tenant

If you are creating an unmanaged tenant, you must first generate and download the necessary private key information from Google Cloud.



**Note** You do not have to follow the steps in this procedure if you are creating a managed tenant.



**Step 4** Choose the appropriate options and enter the appropriate values in each field as listed in the following *Create Tenant Dialog Box Fields* table then continue.

**Table 2: Create Tenant Dialog Box Fields**

Properties	Description
<b>Name</b>	Enter the name of the tenant. Match the regular expression:  [a-z] ([-a-z0-9]*[a-z0-9])?  This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.
<b>Description</b>	Enter a description of the tenant.
<b>Settings</b>	
<b>Add Security Domain</b>	To add a security domain for the tenant: <ol style="list-style-type: none"> <li>Click <b>Add Security Domain</b>. The <b>Select Security Domains</b> dialog appears with a list of security domains in the left pane.</li> <li>Click to choose a security domain.</li> <li>Click <b>Select</b> to add the security domain to the tenant.</li> </ol>
<b>Google Cloud Project</b>	
<b>Google Cloud Project ID</b>	Enter the Google Cloud Project ID that will be associated with this Cisco Cloud Network Controller tenant. Beginning with 26.0(2), you can add multiple GCP projects and select a one of the projects created as a default project. For more information, see <a href="#">“Support for Multiple Cloud Accounts Under a Single Tenant”</a> .
<b>Access Type</b>	For a tenant that will not be managed by the Cisco Cloud Network Controller, choose <b>Unmanaged Identity</b> as the access type.  For more information, see <a href="#">Understanding Google Cloud Deployments with Cisco Cloud Network Controller</a> .
<b>Key ID</b>	Enter the information from the <code>private_key_id</code> field in the JSON file that you downloaded in <a href="#">Generating and Downloading Private Key Information from Google Cloud for an Unmanaged Tenant</a> , on page 6.
<b>RSA Private Key</b>	Enter the information from the <code>private_key</code> field in the JSON file that you downloaded in <a href="#">Generating and Downloading Private Key Information from Google Cloud for an Unmanaged Tenant</a> , on page 6.



Properties	Description
<b>Client ID</b>	Enter the information from the <code>client_id</code> field in the JSON file that you downloaded in <a href="#">Generating and Downloading Private Key Information from Google Cloud for an Unmanaged Tenant, on page 6</a> .
<b>Email</b>	Enter the email address associated with your Google Cloud project.
<b>Add Security Domain for Google Cloud Project</b>	<p><b>Note</b> Adding a security domain for Google Cloud is optional when creating a tenant.</p> <p>To add a security domain for the account:</p> <ol style="list-style-type: none"> <li>Click <b>Add Security Domain for Google Cloud Project</b>. The <b>Select Security Domains</b> dialog appears with a list of security domains in the left pane.</li> <li>Click to choose a security domain.</li> <li>Click <b>Select</b> to add the security domain to the tenant.</li> </ol>

**Step 5** Click **Save** when finished.

## Creating an Application Profile Using the Cisco Cloud Network Controller GUI

This section explains how to create an application profile using the Cisco Cloud Network Controller GUI.

### Before you begin

Create a tenant.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Application Management**.

A list of **Application Management** options appear in the **Intent** menu.

**Step 3** From the **Application Management** list in the **Intent** menu, click **Create Application Profile**. The **Create Application Profile** dialog box appears.

**Step 4** Enter a name in the **Name** field.

Note the following restrictions:

- Match the regular expression:

```
[a-z]([-a-z0-9]*[a-z0-9])?
```

This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.

- We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to [Naming Length Restrictions Imposed By Google Cloud Firewall Rules](#) to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.

**Step 5** Choose a tenant:

a) Click **Select Tenant**.

The **Select Tenant** dialog box appears.

b) From the **Select Tenant** dialog, click to choose a tenant in the left column then click **Select**.

You return to the **Create Application Profile** dialog box.

**Step 6** Enter a description in the **Description** field.

**Step 7** Click **Save** when finished.

## Creating a VRF Using the Cisco Cloud Network Controller GUI

This section explains how to create a VRF using the Cisco Cloud Network Controller GUI.



**Note** To configure a external VRF, you will select `infra` in the **Tenant** field below. The VRF will be identified as a external VRF if it is:

- Configured under the `infra` tenant
- Associated with an external network (see [Creating an External Network Using Cloud Native Routers Using the Cisco Cloud Network Controller GUI](#), on page 11)
- Not associated with a cloud context profile

### Before you begin

Create a tenant.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Application Management**.

A list of **Application Management** options appear in the **Intent** menu.

**Step 3** From the **Application Management** list in the **Intent** menu, click **Create VRF**. The **Create VRF** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create VRF Dialog Box Fields* table then continue.

**Table 3: Create VRF Dialog Box Fields**

Properties	Description
General	

Properties	Description
<b>Name</b>	<p>Enter a name for the VRF in the <b>Name</b> field.</p> <p>Note the following restrictions:</p> <ul style="list-style-type: none"> <li>Match the regular expression:           <pre>[a-z]([-a-z0-9]*[a-z0-9])?</pre> <p>This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.</p> </li> <li>We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to <a href="#">Naming Length Restrictions Imposed By Google Cloud Firewall Rules</a> to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.</li> </ul> <p>All VRFs are assigned a <i>vrfEncoded</i> value. If the Tenant and VRF name combination has more than 32 characters, then a VRF name (which also contains the tenant name) is identified in the cloud router using the <i>vrfEncoded</i> value. To see the <i>vrfEncoded</i> value, navigate to <b>Application Management &gt; VRFs</b> subtab. Click a VRF on the right hand pane and look for <i>Encoded VRF Name in Cloud Router</i>.</p>
<b>Tenant</b>	<p>To choose a tenant:</p> <ol style="list-style-type: none"> <li>Click <b>Select Tenant</b>. The <b>Select Tenant</b> dialog box appears.</li> <li>From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column then click <b>Select</b>. You return to the <b>Create VRF</b> dialog box.</li> </ol>
<b>Description</b>	Enter a description of the VRF.

**Step 5** When finished, click **Save**.

## Creating an External Network Using Cloud Native Routers Using the Cisco Cloud Network Controller GUI

This procedure describes how to create an external network. You can have a single external network that can connect to multiple routers on the on-premises site, or you can have multiple external networks with multiple VRFs that you can use to connect to CCRs.

### Before you begin

You must have a hub network created before you can create an external network.

**Step 1** In the left navigation bar, navigate to **Application Management > External Networks**.

The configured external networks are displayed. Note that because Cisco Cloud Network Controller supports only one hub network, you will see only one hub network displayed in the **Hub Network** column.

**Step 2** Click **Actions**, then choose **Create External Network**.  
The **Create External Network** window appears.

**Note** If there is no hub network configured yet, you will see a warning at the top of the page, saying that you must create a hub network before you can create an external network. Click the blue **Cisco Cloud Network Controller Setup** link in the message to create a hub network, then return here. For more information on creating a hub network, see the "Configuring Cisco Cloud Network Controller Using the Setup Wizard" chapter in the [Cisco Cloud Network Controller for Google Cloud Installation Guide](#), Release 25.0(x) or later.

**Step 3** Enter the appropriate values in each field as listed in the following *Create External Network Dialog Box Fields* table then continue.

**Table 4: Create External Network Dialog Box Fields**

Properties	Description
<b>General</b>	
<b>Name</b>	Enter the name for the external network.
<b>VRF</b>	<p>This external VRF will be used for external connectivity with the on-premises CCR. You can create multiple external VRFs for this purpose.</p> <p>This VRF will be identified as an external VRF if the VRF has all three of the following characteristics:</p> <ul style="list-style-type: none"> <li>• Configured under the <i>infra</i> tenant</li> <li>• Associated with an external network</li> <li>• Not associated with a cloud context profile</li> </ul> <p>Any VRF that is associated with an external network becomes an external VRF. At that point, that external VRF is not allowed to be created under any tenant other than the <i>infra</i> tenant, and that external VRF is not allowed to be associated with a cloud context profile or subnet.</p> <p>To choose an external VRF:</p> <ol style="list-style-type: none"> <li>a. Click <b>Select VRF</b>. The <b>Select VRF</b> dialog box appears.</li> <li>b. From the <b>Select VRF</b> dialog, click to choose a VRF in the left column. You can also create a VRF using the + <b>Create VRF</b> option.</li> <li>c. Click <b>Select</b>. You return to the <b>Create External Network</b> dialog box.</li> </ol>
<b>Hub Network</b>	<p>The hub network is displayed automatically after you configured it in the First Time Setup.</p> <p><b>Note</b> If there is no hub network configured yet, you must create a hub network before you can create an external network. For more information on creating a hub network, see the "Configuring Cisco Cloud Network Controller Using the Setup Wizard" chapter in the <a href="#">Cisco Cloud Network Controller for Google Cloud Installation Guide</a>, Release 25.0(x) or later.</p>

Properties	Description
VPN Router	This field is not editable. The default VPN router is automatically selected.
<b>Settings</b>	
<b>Regions</b>	<p>To choose a region:</p> <ol style="list-style-type: none"><li>Click <b>Add Regions</b>. The <b>Select Regions</b> dialog box appears.<ul style="list-style-type: none"><li>The regions that you selected as part of the First Time Setup are displayed here.</li><li>You can select multiple regions to bring up the cloud router in multiple regions.</li></ul></li><li>From the <b>Select Regions</b> dialog, click to choose a region in the left column then click <b>Select</b>. You return to the <b>Create External Network</b> dialog box.</li></ol>

Properties	Description
VPN Networks	<p>The VPN networks entries are used for internal connectivity. All configured VPN networks will be applied to all the selected regions.</p> <p>To add a VPN network:</p> <ol style="list-style-type: none"> <li>a. Click <b>Add VPN Network</b>. The <b>Add VPN Network</b> dialog box appears.</li> <li>b. In the <b>Name</b> field, enter a name for the VPN network.</li> <li>c. Click <b>+ Add IPSec Peer</b>. Two tunnels are created for each IPSec peer entry.</li> <li>d. Enter values for the following fields for the IPSec peer that you want to add: <ul style="list-style-type: none"> <li>• <b>Public IP of IPSec Tunnel Peer</b></li> <li>• <b>Pre-Shared Key</b></li> <li>• <b>IKE Version</b>: Select <b>ikev1</b> or <b>ikev2</b> for IPSec tunnel connectivity</li> <li>• <b>BGP Peer ASN</b></li> <li>• <b>Subnet Pool Name</b>: Click <b>Select Subnet Pool Name</b>. The <b>Select Subnet Pool Name</b> dialog box appears. Select one of the available subnet pools that are listed, then click <b>Select</b>.</li> </ul> <p><b>Note</b> Additional IPsec tunnel subnet pools can be added in the <b>External Networks</b> page, or through the Cloud Network Controller First Time Set Up, if necessary. For more information on adding additional subnet pools through the Cloud Network Controller First Time Set Up, see the chapter "Configuring Cisco Cloud Network Controller Using the Setup Wizard" in the <i>Cisco Cloud Network Controller for GCP Installation Guide</i>, Release 25.1(x). The subnet pool size should be large enough to accommodate the number of IPsec tunnels that will get created.</p> </li> <li>e. Click the checkmark to add this IPSec tunnel. Click <b>+ Add IPSec Tunnel</b> if you want to add another IPSec tunnel.</li> <li>f. Click <b>Add</b> in the <b>Add VPN Network</b> dialog box. You return to the <b>Create External Network</b> dialog box.</li> </ol>

**Step 4**

When you have finished creating the external network, click **Save**.

After you click **Save** in the **Create External Network** window, cloud routers are then configured in Google Cloud.

To verify that cloud routers were configured in Google Cloud, in your Google Cloud account, navigate to **Hybrid Connectivity > Cloud Routers**. You should see the cloud routers created for the different regions (note that you might have to click Refresh to bring up the newly-configured cloud routers).

To see the IPSec sessions, navigate to **Hybrid Connectivity > VPN > Cloud VPN Tunnels**.


## Configuring Inter-Site Networking Using BGP-EVPN

Beginning with release 25.0(5), for inter-site use cases, support is available for configuring a BGP-EVPN connection for inter-site connectivity in these scenarios:

- Cloud site-to-cloud site:
  - Google Cloud site-to-Google Cloud site
  - Google Cloud site-to-AWS site
  - Google Cloud site-to-Azure site
- Google Cloud site-to-ACI on-premises site

In each of these scenarios, Cisco Catalyst 8000Vs are used for the BGP-EVPN connection. See [Inter-Site Connectivity Using BGP-EVPN](#) for more information.

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**Step 1** In the Cisco Cloud Network Controller GUI, click the Intent icon (  ) and select **Cloud Network Controller Setup**.

**Step 2** In the **Region Management** area, click **Edit Configuration**.

The **Region Management** page appears.

**Step 3** Locate the regions where you want to use the Cisco Catalyst 8000V router for inter-site connectivity, then click the box in the **Catalyst 8000Vs** column for those regions.

This is functionality introduced in release 25.0(5) that allows you to configure a BGP-EVPN connection for inter-site connectivity between a Google Cloud site and other cloud sites or an ACI on-premises site using Cisco Catalyst 8000V routers. See [Inter-Site Connectivity Using BGP-EVPN](#) for more information.

**Step 4** Click **Next** at the bottom of the page.

The **General Connectivity** page appears.

**Step 5** Enter the necessary information in the **Subnet Pools for Cloud Routers** area.

The first subnet pool is automatically populated (shown as `System Internal`). Addresses from this subnet pool will be used for inter-region connectivity for any additional regions that are added that need to be managed by the Cisco Cloud Network Controller. Subnet pools added in this field must be a valid IPv4 subnet with mask /24.

If you selected additional regions to have Catalyst 8000Vs deployed in the previous page, add *one* additional subnet pool for every region where you will have 2-4 Catalyst 8000Vs deployed (if you enter **2**, **3**, or **4** in the **Number of Routers Per Region** field in [6.c, on page 16](#)).

**Step 6** For release 25.0(5) and later, enter the necessary information in the **Catalyst 8000Vs** area.

- a) In the **BGP Autonomous System Number for C8kVs** field, enter a unique BGP autonomous system number (ASN).

The BGP autonomous system number can be in the range of 1- 65535.

- b) In the **Assign Public IP to C8kV Interface** field, determine if you want to assign public IP addresses to the Catalyst 8000V interfaces.

Private IP addresses are assigned to the Catalyst 8000V interfaces by default. The **Assign Public IP to C8kV Interface** option determines whether public IP addresses will also be assigned to the Catalyst 8000V interfaces or not.

The Catalyst 8000V interface IP addresses are used for the following purposes:

- Allows you to manage the Catalyst 8000V or allows you to SSH to the Catalyst 8000V directly
- Allows you to cross-program the interfaces across sites for multi-cloud and hybrid cloud connectivity through the Cisco Nexus Dashboard Orchestrator
- For the Catalyst 8000Vs for both control plane and data plane traffic

By default, the **Enabled** check box is checked. This means that public IP addresses can be assigned to the Catalyst 8000Vs.

- If you want *public* IP addresses assigned to the Catalyst 8000Vs in addition to the private IP addresses, leave the check in the box next to **Enabled**.
- If you want only *private* IP addresses assigned to the Catalyst 8000Vs, remove the check in the box next to **Enabled** to disable this option.

Note that changing the Catalyst 8000V connectivity from private to public, or vice versa, may cause disruption in your network. In addition, if the public IP address is removed from the Catalyst 8000V, then the Google Cloud site will connect to the on-premises ACI site using the private IP address via the Google Cloud interconnect. You will have to configure private intersite connectivity for the Google Cloud site from Nexus Dashboard Orchestrator and configure Google Cloud interconnect from the Google Cloud portal.

**Note** Both the public and private IP addresses assigned to a Catalyst 8000V are displayed with the other details of the router in the **Cloud Resources** area. If public IP addresses are not assigned to a Catalyst 8000V, only the private IP addresses are displayed.

- In the **Number of Routers Per Region** field, choose the number of Catalyst 8000Vs that will be used in each region.
- In the **Username**, enter the username for the Catalyst 8000V.
- In the **Password** field, enter the password for the Catalyst 8000V.

Enter the password again in the **Confirm Password** field.

- In the **Throughput of the routers** field, choose the throughput of the Catalyst 8000V.

Changing the value in this field changes the size of the Catalyst 8000V instance that is deployed. Choosing a higher value for the throughput results in a larger VM being deployed.

Note the following:

- The licensing of the Catalyst 8000V is based on this setting. You will need the equivalent or higher license in your Smart account for it to be compliant. See "Resources Used for Cisco Cloud Network Controller Deployment in Google Cloud" in the [Cisco Cloud Network Controller for Google Cloud Installation Guide](#) for more information.
- Cloud routers should be undeployed from all regions before changing the router throughput or login credentials.

If you wish to change this value at some point in the future, you must delete the Catalyst 8000V, then repeat the processes in this chapter again and select the new value that you would like in the same **Throughput of the routers** field.

- Enter the necessary information in the **TCP MSS** field, if applicable.

The **TCP MSS** option is available to configure the TCP maximum segment size (MSS). This value will be applied to all cloud router interfaces, including data Gigabit Ethernet interfaces, IPSec tunnel interfaces of cloud routers,



and VPN tunnel interfaces toward cloud, on-premises, or other cloud sites. For VPN tunnels towards the cloud, if the cloud provider's MSS value is less than the value that you enter in this field, then the lower value is used; otherwise, the value that you enter in this field is used.

The MSS value affects only TCP traffic, and has no impact on other types of traffic, such as ping traffic.

- h) In the **License Token** field, enter the license token for the Catalyst 8000V.

This is the Product Instance Registration token from your Cisco Smart Software Licensing account. To get this license token, go to <http://software.cisco.com>, then navigate to **Smart Software Licensing > Inventory > Virtual Account** to find the Product Instance Registration token. See "Cisco Cloud Network Controller Licensing" in the *Cisco Cloud Network Controller for Google Cloud Installation Guide* for more information.

**Note** If you assigned private IP addresses to the Catalyst 8000Vs in 6.b, on page 15, the only supported option is **Direct connect to Cisco Smart Software Manager (CSSM)** when registering smart licensing for Catalyst 8000Vs with private IP addresses. You must provide reachability to the CSSM through express route in this case.

**Step 7** When you have entered all the necessary information on this page, click **Save and Continue** at the bottom of the page.

**Step 8** In the **Advanced Settings** area, click **Edit Configuration**.

**Step 9** In the **Contract Based Routing** field, click the box next to **yes** to enable contract-based routing, then click **Save and Continue**.

**Note** You can also enable contract-based routing through Nexus Dashboard Orchestrator by navigating to the Google Cloud site in Nexus Dashboard Orchestrator, then clicking the **Contract Based Routing** option under the **Inter-Site Connectivity** area.

**Step 10** Click **Done** at the bottom of the **Let's Configure the Basics** window.

**Step 11** Verify that the number of VM instances on the Google Cloud side match the number of Catalyst 8000Vs that you set up in the Cisco Cloud Network Controller.

- Log into the Google Cloud project associated with the infra tenant.
- Navigate to **Compute Engine > VM instances** in Google Cloud.
- Verify that the number of VM instances shown in the **Instances** tab match the total number of Catalyst 8000Vs that you have for the BGP-EVPN connection for inter-site connectivity.

For example, if you chose two regions and two Catalyst 8000Vs for each region, you should see four VM instances in the **Instances** tab.

**Step 12** Verify that you have the VPC networks set up for the overlay-1 VPC and overlay-1 secondary VPC in Google Cloud. See [Inter-Site Connectivity Using BGP-EVPN](#) for more information.

- Navigate to **VPC network > VPC networks** in Google Cloud.
- Verify that you see the VPC networks that were set up for the overlay-1 VPC and overlay-1 secondary VPC in the **VPC networks** screen.

**Step 13** Verify that the Catalyst 8000Vs that you set up in the Cisco Cloud Network Controller are showing up correctly in the appropriate Cisco Cloud Network Controller GUI screens.

- In the **Dashboard** page, locate the **Connectivity** pane and verify that the Catalyst 8000Vs that you set up in the Cisco Cloud Network Controller show up correctly in this screen.
- Navigate to **Infrastructure > Inter-Site Connectivity** and verify that the Catalyst 8000Vs that you set up in the Cisco Cloud Network Controller show up correctly in this screen.

- Navigate to **Cloud Resources > Routers** and verify that the Catalyst 8000Vs that you set up in the Cisco Cloud Network Controller show up correctly in this screen.

**Step 14** Configure VPC peering for the inter-site connectivity using BGP-EVPN.

When you configure a BGP-EVPN connection for inter-site connectivity using Cisco Catalyst 8000V routers, you must make additional configurations to allow the user VPCs in the Google Cloud site to communicate with VPCs in other cloud sites or an ACI on-premises site.

Typically you would configure VPC peering for inter-site connectivity using BGP-EVPN through Nexus Dashboard Orchestrator, where you would create a VRF and then check **Hub Peering** for that VRF. See the appropriate [Nexus Dashboard Orchestrator documentation](#) for those procedures.

To change this configuration on the Cisco Cloud Network Controller side:

- In the Cisco Cloud Network Controller GUI, navigate to **Application Management > Cloud Context Profiles**.
- Under the **Name** column, double-click the name of the cloud context profile that is associated with the VPC that you want to peer with the overlay-1 VPC.

Another window appears that provides more detailed information for this cloud context profile.

- Click **Actions > Edit**.
- In the **VPC Hub Peering** area, click the box next to **Enable** to enable VPC peering for this VPC, then click **Save**.
- In the Google Cloud, navigate to **VPC network > VPC network peering**.
- Verify that your user VPC in the Google Cloud site is peering with the overlay-1 VPC.

## Configuring Inter-VRF Route Leaking Using the Cisco Cloud Network Controller GUI

Using inter-VRF route leaking, you can configure an independent routing policy to specify which routes to leak between a pair of VRFs when you are setting up routing between these types of sites:

- Two cloud sites
- A cloud site and a non-ACI on-premises site



**Note** See [Configuring Routing and Security Policies Separately](#) for more information.

**Step 1** In the left navigation bar, navigate to **Application Management > VRFs**.

The configured VRFs are displayed.

**Step 2** Click the **Leak Routes** tab.

Any already-configured leak routes are displayed.

**Step 3** Click **Actions**, then choose **Create Leak Route**.

The **Create Leak Route** window appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Leak Routes Dialog Box Fields* table then continue.

Table 5: Create Leak Routes Dialog Box Fields

Properties	Description
Source VRF	<p>To choose a source VRF:</p> <ol style="list-style-type: none"> <li>Click <b>Select a Source VRF</b>. The <b>Select a VRF</b> dialog box appears.</li> <li>From the <b>Select a VRF</b> dialog, click to choose a VRF in the left column to use for the source VRF. Note that the source VRF can be an internal or an external (transport) VRF.</li> <li>Click <b>Select</b> to select this source VRF. You return to the <b>Create Leak Route</b> dialog box.</li> </ol>
Destination VRF	<p>To choose a destination VRF:</p> <ol style="list-style-type: none"> <li>Click <b>Select a Destination VRF</b>. The <b>Select a VRF</b> dialog box appears.</li> <li>From the <b>Select a VRF</b> dialog, click to choose a VRF in the left column to use for the destination VRF.</li> <li>Click <b>Select</b> to select this destination VRF. You return to the <b>Create Leak Route</b> dialog box.</li> </ol>
Type	<p>Choose the type of leaked route that you want to configure:</p> <ul style="list-style-type: none"> <li><b>Leak All</b>: Select to configure all routes to leak between the VRFs. The entry <code>0.0.0.0/0</code> is entered automatically in the subnet IP area by default in this case.</li> <li><b>Subnet IP</b>: Select to configure a specific subnet IP address as the route to leak between VRFs. The <b>Subnet IP</b> box appears. In the <b>Subnet IP</b> box, enter a subnet IP address as the route to leak between VRFs. To configure multiple subnet IP addresses as the route to leak between VRFs, enter additional entries for the different subnets.</li> </ul>

**Step 5** When finished, click **Save**.  
The **Success** window appears.

**Step 6** Determine if you want to configure additional inter-VRF route leaking.

- If you want to add another route to leak between a pair of VRFs, click the **Add Another Route** option in the **Success** window.

You are returned to the **Add Leak Route** window. Repeat [Step 4, on page 18](#) through [Step 5, on page 19](#) to configure another route to leak between a pair of VRFs.

- If you want to add a reverse route, where:
  - The destination VRF from the previous configuration now becomes the source VRF, and

- The source VRF from the previous configuration now becomes the destination VRF

Then click the **Add Reverse Route** option in the **Success** window.

You are returned to the **Add Leak Route** window. Repeat [Step 4, on page 18](#) through [Step 5, on page 19](#) to configure another route, but this time:

- In the **Source VRF** field, select the VRF that you had selected as a destination VRF in the previous configuration.
- In the **Destination VRF** field, select the VRF that you had selected as a source VRF in the previous configuration.

**Step 7** When you have finished configuring leak routes, click **Done**.

The **Leak Routes** tab in the main **VRFs** page is displayed again, with the newly configured leak route displayed.

**Step 8** To get more information on a source or destination VRF, or to make changes to a configured leak route, double-click the VRF in the **Leak Routes** tab in the main **VRFs** page.

The **Overview** page for that VRF is displayed.

**Step 9** Click the **Application Management** tab at the top of the VRF page, then click the **Leak Routes** tab in the left nav bar. The leak routes associated with this particular VRF are displayed.

**Step 10** Configure additional leak routes associated with this VRF, if necessary.

- To add a leak route from this VRF, click **Actions**, then choose **Add Leak Route from <VRF\_name>**.

The **Add Leak Route** window appears. Enter the necessary information as you did previously using the information in [Step 4, on page 18](#). Note that the entry in the **Source VRF** is pre-selected and cannot be changed in this situation.

- To add a leak route to this VRF, click **Actions**, then choose **Add Leak Route to <VRF\_name>**.

The **Add Leak Route** window appears. Enter the necessary information as you did previously using the information in [Step 4, on page 18](#). Note that the entry in the **Destination VRF** is pre-selected and cannot be changed in this situation.

---

## Enabling Connectivity Between Google Cloud and External Devices

Follow these procedures to manually enable connectivity between a Google Cloud Router and an external device.

### Downloading the External Device Configuration Files

---

**Step 1** In the Cisco Cloud Network Controller GUI, click on **Dashboard**.

The **Dashboard** view for the Cisco Cloud Network Controller appears.

**Step 2** In the **Connectivity** area, under **External Connectivity Status**, click on the number above the **Cloud Routers** entry. The **External Connectivity** window appears.

**Step 3** Click **Actions > Download External Device Configuration Files**.

The **Download External Device Configuration Files** pop-up appears.

**Step 4** Select the external device configuration files to download and click **Download**.

This action downloads a zip file that contains configuration information that you will use to enable connectivity between the Google Cloud Router and the external devices.

## Enabling Connectivity Between Google Cloud and the External Devices

### Before you begin

Download the external device configuration files using the procedures in [Downloading the External Device Configuration Files, on page 20](#).

- Step 1** Gather the necessary information that you will need to enable connectivity between the Google Cloud Router and the external devices.
- Step 2** Log into the external device.
- Step 3** Enter the configuration information to connect an external networking device with the cloud ACI fabric.

If you downloaded the external device configuration files using the instructions in [Downloading the External Device Configuration Files, on page 20](#), locate the configuration information for the first tunnel and enter that configuration information.

Following is an example of what the external device configuration file might look like for the first tunnel, where **PRESHARED-KEY** is taken from the vpn-connectivity configuration page:

```
! The following file contains configuration recommendation to connect an external networking device
! with the cloud ACI Fabric
! The configurations here are provided for an IOS-XE based device. The user is expected to understand
! the configs and make any necessary amends before using them
! on the external device. Cisco does not assume any responsibility for the correctness of the config.

! Tunnel to 54.215.245.58 5.500 for
hcloudVpnIf.acct-[infra]/region-[us-west1]/hubCtx-[1]-id-[0]/ext-[extwfoo_us-west1]/vpn-[vpnrwfoo]/itr-default-peer-54.215.245.58/src-1-dest-[54.215.245.58]
! USER-DEFINED: please define rd: RD
! USER-DEFINED: please provide preshared-key: PRESHARED-KEY
! USER-DEFINED: please define router-id: ROUTER-ID
! USER-DEFINED: please define gig-number: GIG-NUMBER
! USER-DEFINED: please define gig-gateway: GIG-GATEWAY
! ikev: ikev2
! vrf-name: extv1
! user name: root
! tunnel counter: 5
! IPV4 address: 35.220.50.132
! tunnel interface destination: 54.215.245.58
! tunne id: 500
! BGP peer address: 169.254.10.6
! BGP peer neighbor address: 169.254.10.5
! BGP peer ASN: 64513
! hcloudHubCtx ASN: 64512

vrf definition extv1
  rd RD:1
  address-family ipv4
  exit-address-family
exit

interface Loopback0
  vrf forwarding extv1
  ip address 41.41.41.41 255.255.255.255
```

```

exit

crypto ikev2 proposal ikev2-1
  encryption aes-cbc-256 aes-cbc-192 aes-cbc-128
  integrity sha512 sha384 sha256 sha1
  group 24 21 20 19 16 15 14 2
exit

crypto ikev2 policy ikev2-1
  proposal ikev2-1
exit

crypto ikev2 keyring keyring-root-5
  peer peer-ikev2-keyring
  address 35.220.50.132
  pre-shared-key PRESHARED-KEY
  exit
exit

crypto ikev2 profile ikev-profile-root-5
  match address local interface GIG-NUMBER
  match identity remote address 35.220.50.132 255.255.255.255
  identity local address 54.215.245.58
  authentication remote pre-share
  authentication local pre-share
  keyring local keyring-root-5
  lifetime 3600
  dpd 10 5 periodic
exit

crypto ipsec transform-set ikev-transport-root-5 esp-gcm 256
  mode tunnel
exit

crypto ipsec profile ikev-profile-root-5
  set transform-set ikev-transport-root-5
  set pfs group14
  set ikev2-profile ikev-profile-root-5
exit

interface Tunnel500
  vrf forwarding extvl
  ip address 169.254.10.6 255.255.255.252
  ip mtu 1400
  ip tcp adjust-mss 1400
  tunnel source GIG-NUMBER
  tunnel mode ipsec ipv4
  tunnel destination 35.220.50.132
  tunnel protection ipsec profile ikev-profile-root-5
exit

ip route 35.220.50.132 255.255.255.255 GIG-NUMBER GIG-GATEWAY

router bgp 64513
  bgp router-id ROUTER-ID
  bgp log-neighbor-changes

  address-family ipv4 vrf extvl
    network 41.41.41.41 mask 255.255.255.255
    neighbor 169.254.10.5 remote-as 64512
    neighbor 169.254.10.5 ebgp-multihop 255
    neighbor 169.254.10.5 activate
  exit-address-family

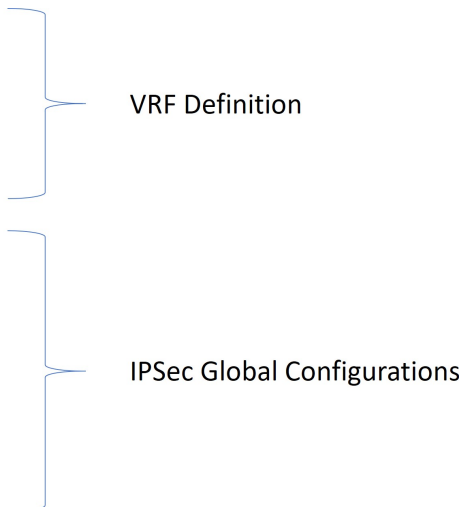
```

```
exit
```

The following figures provide more information on what each set of fields is used for in the external device configuration file:

- The fields shown in the following figure are used to configure these areas:
  - VRF definition
  - IPSec global configurations

```
vrf definition Ext-V1
rd 1:10
!
address-family ipv4
  route-target export 64550:10
  route-target import 64550:10
!
crypto isakmp policy 10
encryption aes
authentication pre-share
group 2
lifetime 28800
!
crypto isakmp keepalive 10 10 periodic
crypto isakmp aggressive-mode disable
!
```



The diagram shows two blue curly braces on the right side of the configuration text. The top brace groups the VRF definition lines: 'vrf definition Ext-V1', 'rd 1:10', '!', 'address-family ipv4', 'route-target export 64550:10', 'route-target import 64550:10', and '!', with the label 'VRF Definition' to its right. The bottom brace groups the IPSec global configuration lines: 'crypto isakmp policy 10', 'encryption aes', 'authentication pre-share', 'group 2', 'lifetime 28800', '!', 'crypto isakmp keepalive 10 10 periodic', 'crypto isakmp aggressive-mode disable', and '!', with the label 'IPSec Global Configurations' to its right.

- The fields shown in the following figure are used to configure these areas:
  - IPSec and ikev1 per tunnel configurations
  - BGP configurations for the VRF neighbor

## Creating an EPG Using the Cisco Cloud Network Controller GUI

```

!
crypto keyring Ext-V1-1000-ike
pre-shared-key address <50.18.55.126>[cAPIC CSR Gig3 Public IP] key <abcdefg12345>
!
crypto isakmp profile Ext-V1-1000-ike
keyring Ext-V1-1000-ike
match identity address <50.18.55.126>[cAPIC CSR1 gig3 Public IP] 255.255.255.255
!
crypto ipsec transform-set Ext-V1-1000-ike esp-aes esp-sha-hmac
mode tunnel
!
crypto ipsec profile Ext-V1-1000-ike
set security-association lifetime kilobytes disable
set security-association replay window-size 512
set transform-set Ext-V1-1000-ike
set pfs group14
!
interface Tunnel1000
vrf forwarding Ext-V1
ip address 50.50.0.2[cAPIC CSR BGP Peer Addr] 255.255.255.252
ip mtu 1400
ip tcp adjust-mss 1400
tunnel source GigabitEthernet2
tunnel mode ipsec ipv4
tunnel destination <50.18.55.126>[cAPIC CSR1 gig3 Public IP]
tunnel protection ipsec profile Ext-V1-1000-ike
!
router bgp 64550
!
address-family ipv4 vrf Ext-V1
redistribute connected
neighbor <50.50.0.1>[cAPIC CSR1 Tunnel Inner IP Addr] remote-as 1234
neighbor 50.50.0.1 ebgp-multihop 255
neighbor 50.50.0.1 activate
neighbor 50.50.0.1 send-community both
neighbor <50.50.0.5>[cAPIC CSR1 Tunnel Inner IP Addr] remote-as 1234
neighbor 50.50.0.5 ebgp-multihop 255
neighbor 50.50.0.5 activate
neighbor 50.50.0.5 send-community both
distance bgp 20 200 20
!
ip route 50.18.55.126[cAPIC CSR1 gig3 Public IP] 255.255.255.255 GigabitEthernet2 10.10.0.103

```

IPSec and Ikev1  
Per Tunnel Configurations

BGP Configurations for VRF Neighbor

- The fields shown in the following figure are used to configure these areas:

- Ikev2 global configurations
- IPSec and ikev2 per tunnel configurations

```

crypto ikev2 proposal ikev2-1
encryption aes-cbc-256 aes-cbc-192 aes-cbc-128
integrity sha512 sha384 sha256 sha1
group 24 21 20 19 16 15 14 2
!
crypto ikev2 policy ikev2-1
proposal ikev2-1
!
crypto ikev2 keyring keyring-ikev2-2000
peer peer-ikev2-keyring
address 35.81.94.248 [cAPIC CSR1 gig3 Public IP]
pre-shared-key abcdefg12345
!
crypto ikev2 profile ikev2-2000
match address local interface GigabitEthernet3
match identity remote address 35.81.94.248[cAPIC CSR1 gig3 Public IP] 255.255.255.255
identity local address 52.53.49.193 [Local Device tunnel source interface Public IP (Gig3 public IP)]
authentication remote pre-share
authentication local pre-share
keyring local keyring-ikev2-2000
lifetime 3600
dpd 10 5 on-demand
!
crypto ipsec transform-set ikev2-2000 esp-gcm 256
mode tunnel
!
crypto ipsec profile ikev2-2000
set transform-set ikev2-2000
set pfs group14
set ikev2-profile ikev2-2000
!
interface Tunnel2000
vrf forwarding Ext-V1
ip address 50.50.0.14 [cAPIC CSR1 BGP Peer Addr] 255.255.255.252
ip mtu 1400
ip tcp adjust-mss 1400
tunnel source GigabitEthernet3
tunnel mode ipsec ipv4
tunnel destination 35.81.94.248[cAPIC CSR1 gig3 Public IP]
tunnel protection ipsec profile ikev2-2000

```

Ikev2 Global Configurations

IPSec and Ikev2  
Per Tunnel Configurations

## Creating an EPG Using the Cisco Cloud Network Controller GUI

Use the procedures in this section to create an application EPG or an external EPG. The available configuration options vary, depending on which type of EPG you are creating.



## Creating an Application EPG Using the Cisco Cloud Network Controller GUI

This section explains how to create an application EPG using the Cisco Cloud Network Controller GUI. Each service needs at least one consumer EPG and one provider EPG.

### Before you begin

Create an application profile and a VRF.

- 
- Step 1** Click the **Intent** icon.  
The **Intent** menu appears.
- Step 2** Click the drop-down arrow below the **Intent** search box and choose **Application Management**.  
A list of **Application Management** options appear in the **Intent** menu.
- Step 3** From the **Application Management** list in the **Intent** menu, click **Create EPG**.  
The **Create EPG** dialog box appears.
- Step 4** Enter the appropriate values in each field as listed in the following *Create EPG Dialog Box Fields* table then continue.

**Table 6: Create EPG Dialog Box Fields**

Properties	Description
<b>General</b>	
<b>Name</b>	<p>Enter the name of the EPG.</p> <p>Note the following restrictions:</p> <ul style="list-style-type: none"> <li>Match the regular expression:  <code>[a-z]([-a-z0-9]*[a-z0-9])?</code> </li> </ul> <p>This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.</p> <ul style="list-style-type: none"> <li>We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to <a href="#">Naming Length Restrictions Imposed By Google Cloud Firewall Rules</a> to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.</li> </ul>
<b>Tenant</b>	<p>To choose a tenant:</p> <ol style="list-style-type: none"> <li>Click <b>Select Tenant</b>. The <b>Select Tenant</b> dialog box appears.</li> <li>From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column.</li> <li>Click <b>Select</b>. You return to the <b>Create EPG</b> dialog box.</li> </ol>

Properties	Description
<b>Application Profile</b>	<p>To choose an application profile:</p> <ol style="list-style-type: none"> <li>Click <b>Select Application Profile</b>. The <b>Select Application Profile</b> dialog box appears.</li> <li>From the <b>Select Application Profile</b> dialog, click to choose an application profile in the left column. <ul style="list-style-type: none"> <li><b>Note</b> If you are creating an EPG in the infra tenant, we recommend that you do not choose the <code>cloud-infra</code> application profile because that application profile is used by EPGs in the overlay-1 VRF. Select a different application profile or click <b>Create Application Profile</b> to create a new one.</li> </ul> </li> <li>Click <b>Select</b>. You return to the <b>Create EPG</b> dialog box.</li> </ol>
<b>Description</b>	Enter a description of the EPG.
<b>Settings</b>	
<b>Type</b>	Because this will be an application EPG, choose <b>Application</b> as the EPG type.
<b>VRF</b>	<p>To choose a VRF:</p> <ol style="list-style-type: none"> <li>Click <b>Select VRF</b>. The <b>Select VRF</b> dialog box appears.</li> <li>From the <b>Select VRF</b> dialog, click to choose a VRF in the left column.</li> <li>Click <b>Select</b>. You return to the <b>Create EPG</b> dialog box.</li> </ol>

Properties	Description
Endpoint Selectors	

Properties	Description
	<p><b>Note</b> See <a href="#">Configuring Virtual Machines in Google Cloud, on page 42</a> for instructions on configuring virtual machines in Google Cloud as part of the endpoint selector configuration process.</p> <p>To add an endpoint selector:</p> <ol style="list-style-type: none"> <li>a. Click <b>Add Endpoint Selector</b> to open the <b>Add Endpoint Selector</b> dialog.</li> <li>b. In the <b>Add Endpoint Selector</b> dialog, enter a name in the <b>Name</b> field.</li> <li>c. Click <b>Selector Expression</b>. The <b>Key</b>, <b>Operator</b>, and <b>Value</b> fields are enabled.</li> <li>d. Click the <b>Key</b> drop-down list to choose a key. The options are: <ul style="list-style-type: none"> <li>• Choose <b>IP</b> if you want to use an IP address or subnet for the endpoint selector.</li> <li>• Choose <b>Region</b> if you want to use the Google Cloud region for the endpoint selector.</li> <li>• Choose <b>Custom</b> if you want to create a custom key for the endpoint selector.</li> </ul> <p><b>Note</b> When choosing the <b>Custom</b> option, the drop-down list becomes a text box. You need to enter a name for the key in the spaces after <b>custom:</b> (for example, <b>custom: Location</b>).</p> </li> <li>e. Click the <b>Operator</b> drop-down list to choose an operator. The options are: <ul style="list-style-type: none"> <li>• <b>equals</b>: Used when you have a single value in the Value field.</li> <li>• <b>not equals</b>: Used when you have a single value in the Value field.</li> <li>• <b>in</b>: Used when you have multiple comma-separated values in the Value field.</li> <li>• <b>not in</b>: Used when you have multiple comma-separated values in the Value field.</li> <li>• <b>has key</b>: Used if the expression contains only a key.</li> <li>• <b>does not have key</b>: Used for an expression that does not contain a key.</li> </ul> </li> <li>f. Enter a value in the <b>Value</b> field then click the check mark to validate the entries. The value you enter depends on the choices you made for the <b>Key</b> and <b>Operator</b> fields. For example, if the <b>Key</b> field is set to <b>IP</b> and the <b>Operator</b> field is set to <b>equals</b>, the <b>Value</b> field must be an IP address or subnet. However, if the <b>Operator</b> field is set to <b>has key</b>, the <b>Value</b> field is disabled.</li> <li>g. When finished, click the check mark to validate the selector expression.</li> <li>h. Determine if you want to create additional endpoint selector expressions to the endpoint selector. If you create more than one expression under a single endpoint selector, a logical AND exists between those expressions.</li> </ol> <p>For example, assume you created two sets of expressions under a single endpoint selector:</p> <ul style="list-style-type: none"> <li>• Endpoint selector 1, expression 1: <ul style="list-style-type: none"> <li>• <b>Key:</b> Region</li> <li>• <b>Operator:</b> equals</li> </ul> </li> </ul>

Properties	Description
	<ul style="list-style-type: none"> <li>• <b>Value:</b> us-west1</li> </ul> <ul style="list-style-type: none"> <li>• Endpoint selector 1, expression 2:           <ul style="list-style-type: none"> <li>• <b>Key:</b> IP</li> <li>• <b>Operator:</b> equals</li> <li>• <b>Value:</b> 192.0.2.1/24</li> </ul> </li> </ul> <p>In this case, if <i>both</i> of these expressions are true (if the region is us-west1 AND if the IP address belongs to subnet 192.0.2.1/24), then that endpoint is assigned to the Cloud EPG.</p> <p>i. Click the check mark after every additional expression that you want to create under this endpoint selector then click <b>Add</b> when finished.</p> <p>If you create more than one endpoint selector under an EPG, a logical OR exists between those endpoint selectors. For example, assume you had created endpoint selector 1 as described in the previous step, and then you created a second endpoint selector as described below:</p> <ul style="list-style-type: none"> <li>• Endpoint selector 2, expression 1:           <ul style="list-style-type: none"> <li>• <b>Key:</b> Region</li> <li>• <b>Operator:</b> in</li> <li>• <b>Value:</b> us-east1, us-central1</li> </ul> </li> </ul> <p>In this case:</p> <ul style="list-style-type: none"> <li>• If the region is us-west1 AND the IP address belongs to the 192.0.2.1/24 subnet (endpoint selector 1 expressions)</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• If the region is either us-east1 or us-central1 (endpoint selector 2 expression)</li> </ul> <p>Then that end point is assigned to the Cloud EPG.</p>

**Step 5** Click **Save** when finished.

## Creating an External EPG Using the Cisco Cloud Network Controller GUI

This section explains how to create an external EPG using the Cisco Cloud Network Controller GUI. Each service needs at least one consumer EPG and one provider EPG.

### Before you begin

Create an application profile and a VRF.

- Step 1** Click the **Intent** icon.  
The **Intent** menu appears.
- Step 2** Click the drop-down arrow below the **Intent** search box and choose **Application Management**.  
A list of **Application Management** options appear in the **Intent** menu.
- Step 3** From the **Application Management** list in the **Intent** menu, click **Create EPG**.  
The **Create EPG** dialog box appears.
- Step 4** Enter the appropriate values in each field as listed in the following *Create EPG Dialog Box Fields* table then continue.

Table 7: Create EPG Dialog Box Fields

Properties	Description
<b>General</b>	
<b>Name</b>	<p>Enter the name of the EPG.</p> <p>Note the following restrictions:</p> <ul style="list-style-type: none"> <li>Match the regular expression:  <math>[a-z]([-a-z0-9]*[a-z0-9])?</math>            This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.</li> <li>We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to <a href="#">Naming Length Restrictions Imposed By Google Cloud Firewall Rules</a> to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.</li> </ul>
<b>Tenant</b>	<p>To choose a tenant:</p> <ol style="list-style-type: none"> <li>Click <b>Select Tenant</b>. The <b>Select Tenant</b> dialog box appears.</li> <li>From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column.</li> <li>Click <b>Select</b>. You return to the <b>Create EPG</b> dialog box.</li> </ol>
<b>Application Profile</b>	<p>To choose an application profile:</p> <ol style="list-style-type: none"> <li>Click <b>Select Application Profile</b>. The <b>Select Application Profile</b> dialog box appears.</li> <li>From the <b>Select Application Profile</b> dialog, click to choose an application profile in the left column.           <p><b>Note</b> If you are creating an EPG in the infra tenant, we recommend that you do not choose the <code>cloud-infra</code> application profile because that application profile is used by EPGs in the overlay-1 VRF. Select a different application profile or click <b>Create Application Profile</b> to create a new one.</p> </li> <li>Click <b>Select</b>. You return to the <b>Create EPG</b> dialog box.</li> </ol>

Properties	Description
Description	Enter a description of the EPG.
Settings	
Type	Because this will be an external EPG, choose <b>External</b> as the EPG type.
VRF	To choose a VRF: <ol style="list-style-type: none"><li>a. Click <b>Select VRF</b>. The <b>Select VRF</b> dialog box appears.</li><li>b. From the <b>Select VRF</b> dialog, click to choose a VRF in the left column.</li><li>c. Click <b>Select</b>. You return to the <b>Create EPG</b> dialog box.</li></ol>
Route Reachability	The type of route reachability for the external EPG will be automatically selected (either <b>Internet</b> or <b>External-Site</b> ).

Properties	Description
Endpoint Selectors	<p><b>Note</b> See <a href="#">Configuring Virtual Machines in Google Cloud, on page 42</a> for instructions on configuring virtual machines in Google Cloud as part of the endpoint selector configuration process.</p> <p>To add an endpoint selector:</p> <ol style="list-style-type: none"> <li>Click <b>Add Endpoint Selector</b> to add an endpoint selector.</li> <li>Enter a name in the <b>Name</b> field.</li> <li>Enter a subnet in the <b>Subnet</b>.</li> <li>When finished, click the check mark to validate the endpoint selector.</li> <li>Determine if you want to create additional endpoint selectors.</li> </ol> <p>If you create more than one endpoint selector under an EPG, a logical OR exists between those endpoint selectors. For example, assume you created two endpoint selectors:</p> <ul style="list-style-type: none"> <li>• Endpoint selector 1: <ul style="list-style-type: none"> <li>• <b>Name:</b> EP_Sel_1</li> <li>• <b>Subnet:</b> 192.1.1.1/24</li> </ul> </li> <li>• Endpoint selector 2: <ul style="list-style-type: none"> <li>• <b>Name:</b> EP_Sel_2</li> <li>• <b>Subnet:</b> 192.2.2.2/24</li> </ul> </li> </ul> <p>In this case:</p> <ul style="list-style-type: none"> <li>• If the IP address belongs to the 192.1.1.1/24 subnet (endpoint selector 1)</li> </ul> <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> <li>• If the IP address belongs to the 192.2.2.2/24 subnet (endpoint selector 2)</li> </ul> <p>Then that end point is assigned to the Cloud EPG.</p>

**Step 5** Click **Save** when finished.

## Creating a Filter Using the Cisco Cloud Network Controller GUI

This section explains how to create a filter using the Cisco Cloud Network Controller GUI.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Application Management**.

A list of **Application Management** options appear in the **Intent** menu.



**Step 3** From the **Application Management** list in the **Intent** menu, click **Create Filter**. The **Create Filter** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Filter Dialog Box Fields* table then continue.

**Table 8: Create Filter Dialog Box Fields**

<b>Properties</b>	<b>Description</b>
<b>Name</b>	Enter a name for the filter in the <b>Name</b> field.
<b>Tenant</b>	To choose a tenant: <b>a.</b> Click <b>Select Tenant</b> . The <b>Select Tenant</b> dialog box appears. <b>b.</b> From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column then click <b>Select</b> . You return to the <b>Create Filter</b> dialog box.
<b>Description</b>	Enter a description of the filter.

Properties	Description
<b>Add Filter</b>	<p>To add a filter:</p> <ol style="list-style-type: none"> <li>a. Click <b>Add Filter Entry</b>. The <b>Add Filter Entry</b> dialog box appears.</li> <li>b. Enter a name for the filter entry in the <b>Name</b> field.</li> <li>c. Click the <b>Ethernet Type</b> drop-down list to choose an ethernet type. The options are: <ul style="list-style-type: none"> <li>• <b>IP</b></li> <li>• <b>Unspecified</b></li> </ul> <p><b>Note</b> When <b>Unspecified</b> is chosen, any traffic type is allowed, including IP, and the remaining fields are disabled.</p> </li> <li>d. Click the <b>IP Protocol</b> drop-down menu to choose a protocol. The options are: <ul style="list-style-type: none"> <li>• <b>ICMP</b></li> <li>• <b>TCP</b></li> <li>• <b>UDP</b></li> <li>• <b>Unspecified</b></li> </ul> <p><b>Note</b> The remaining fields are enabled only when <b>TCP</b> or <b>UDP</b> is chosen.</p> </li> <li>e. Enter the appropriate port range information in the <b>Destination Port</b> fields.</li> <li>f. When finished entering filter entry information, click <b>Add</b>. You return to the <b>Create Filter</b> dialog box where you can repeat the steps to add another filter entry.</li> </ol>

**Step 5** When finished, click **Save**.

## Creating a Contract Using the Cisco Cloud Network Controller GUI

This section explains how to create a contract using the Cisco Cloud Network Controller GUI.

### Before you begin

Create filters.

- Step 1** Click the **Intent** icon. The **Intent** menu appears.
- Step 2** Click the drop-down arrow below the **Intent** search box and choose **Application Management**.  
A list of **Application Management** options appear in the **Intent** menu.
- Step 3** From the **Application Management** list in the **Intent** menu, click **Create Contract**. The **Create Contract** dialog box appears.
- Step 4** Enter the appropriate values in each field as listed in the following *Create Contract Dialog Box Fields* table then continue.

**Table 9: Create Contract Dialog Box Fields**

Properties	Description
<b>Name</b>	<p>Enter the name of the contract.</p> <p>Note the following restrictions:</p> <ul style="list-style-type: none"> <li>Match the regular expression:  <math>[a-z]([-a-z0-9]*[a-z0-9])?</math></li> </ul> <p>This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.</p> <ul style="list-style-type: none"> <li>We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to <a href="#">Naming Length Restrictions Imposed By Google Cloud Firewall Rules</a> to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.</li> </ul>
<b>Tenant</b>	<p>To choose a tenant:</p> <ol style="list-style-type: none"> <li>Click <b>Select Tenant</b>. The <b>Select Tenant</b> dialog box appears.</li> <li>From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column.</li> <li>Click <b>Select</b>. You return to the <b>Create Contract</b> dialog box.</li> </ol>
<b>Description</b>	Enter a description of the contract.
<b>Settings</b>	

Properties	Description
Scope	<p>The scope limits the contract to any endpoint groups within the same application profile, within the same VRF instance, throughout the fabric (globally), or within the same tenant.</p> <p><b>Note</b> Shared services enables communication between EPGs in different tenants and between EPGs in different VRFs.</p> <p>To enable EPGs in one tenant to communicate with EPGs in another tenant, choose <b>Global</b> scope.</p> <p>To enable an EPG in one VRF to communicate with another EPG in a different VRF, choose <b>Global</b> or <b>Tenant</b> scope.</p> <p>Click the drop-down arrow to choose from the following scope options:</p> <ul style="list-style-type: none"> <li>• <b>Application Profile</b></li> <li>• <b>VRF</b></li> <li>• <b>Global</b></li> <li>• <b>Tenant</b></li> </ul>
Add Filter	<p>To choose a filter:</p> <ol style="list-style-type: none"> <li>a. Click <b>Add Filter</b>. The filter row appears with a <b>Select Filter</b> option.</li> <li>b. Click <b>Select Filter</b>. The <b>Select Filter</b> dialog box appears.</li> <li>c. From the <b>Select Filter</b> dialog, click to choose a filter in the left column then click <b>Select</b>. You return to the <b>Create Contract</b> dialog box.</li> </ol>

**Step 5** Click **Save** when finished.

## Creating an Inter-Tenant Contract Using the Cisco Cloud Network Controller GUI

This section explains how to create an inter-tenant contract using the Cisco Cloud Network Controller GUI.

### Before you begin

Create filters.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Application Management**.

A list of **Application Management** options appear in the **Intent** menu.

**Step 3** From the **Application Management** list in the **Intent** menu, click **Create Contract**. The **Create Contract** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Contract Dialog Box Fields* table then continue.

**Table 10: Create Contract Dialog Box Fields**

Properties	Description
<b>Name</b>	Enter the name of the contract.  This is the name of the contract in Google Cloud. Match the regular expression:  [a-z] ( [-a-z0-9] * [a-z0-9] ) ?  This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.
<b>Tenant</b>	To choose a tenant:  a. Click <b>Select Tenant</b> . The <b>Select Tenant</b> dialog box appears.  b. From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column.  c. Click <b>Select</b> . You return to the <b>Create Contract</b> dialog box.
<b>Description</b>	Enter a description of the contract.
<b>Settings</b>	
<b>Scope</b>	The scope limits the contract to any endpoint groups within the same application profile, within the same VRF instance, throughout the fabric (globally), or within the same tenant.  For inter-tenant communication, you will first create a contract with the <b>Global</b> scope in one of the tenants (for example, <b>tenant1</b> ). This tenant's EPG will always be the provider of this contract.  This contract will then be exported to the other tenant (for example, <b>tenant2</b> ). For the other tenant that imports this contract, its EPG will be the consumer of the imported contract. If you want <b>tenant2</b> 's EPG to be the provider and <b>tenant1</b> 's EPG to be the consumer, then create a contract in <b>tenant2</b> and then export it to <b>tenant1</b> .
<b>Add Filter</b>	To choose a filter:  a. Click <b>Add Filter</b> . The filter row appears with a <b>Select Filter</b> option.  b. Click <b>Select Filter</b> . The <b>Select Filter</b> dialog box appears.  c. From the <b>Select Filter</b> dialog, click to choose a filter in the left column then click <b>Select</b> . You return to the <b>Create Contract</b> dialog box.

**Step 5** Click **Save** when finished.

**Step 6** Export the contract that you just created to another tenant.

For example, assume the following:

- The contract that you created in the procedure above is named **contract1** in tenant **tenant1**.
- The contract that you want to export is named **exported\_contract1** and you are exporting it to tenant **tenant2**.

a) Navigate to the Contracts page (**Application Management > Contracts**).

The configured contracts are listed.

- b) Select the contract that you just created.

For example, scroll through the list until you see the contract **contract1** and click the box next to it to select it.

- c) Go to **Actions > Export Contract**.

The **Export Contract** window appears.

- d) Click **Select Tenant**.

The **Select Tenant** window appears.

- e) Select the tenant that you want to export the contract to, then click **Save**.

For example, **tenant2**. You are returned to the **Export Contract** window.

- f) In the **Name** field, enter a name for the exported contract.

For example, **exported\_contract1**.

- g) In the **Description** field, enter a description for the exported contract, if necessary.

- h) Click **Save**.

The list of contracts appears again.

### Step 7

Configure the first tenant's EPG as the provider EPG, with the original contract, as the first part of the EPG communication configuration.

- a) Click the **Intent** button, then choose **EPG Communication**.

The **EPG Communication** window appears.

- b) Click **Let's Get Started**.

- c) In the **Contract** area, click **Select Contract**.

The **Select Contract** window appears.

- d) Locate and select the contract that you created at the beginning of these procedures.

In this example, you would locate and select **contract1**.

- e) Click **Select**.

The **EPG Communication** window appears.

- f) In the **Provider EPGs** area, click **Add Provider EPGs**.

The **Select Provider EPGs** window appears.

- g) Leave the **Keep selected items** box checked, then select the first tenant's (**tenant1**) EPG.

- h) Click **Select**.

The **EPG Communication** window appears.

- i) Click **Save**.

### Step 8

Configure the second tenant's EPG as the consumer EPG, with the exported contract, as the second part of the EPG communication configuration.

- a) Click the **Intent** button, then choose **EPG Communication**.

The **EPG Communication** window appears.

- b) Click **Let's Get Started**.
  - c) In the **Contract** area, click **Select Contract**.  
The **Select Contract** window appears.
  - d) Locate and select the contract that you created at the beginning of these procedures.  
In this example, you would locate and select **exported\_contract1**.
  - e) Click **Select**.  
The **EPG Communication** window appears.
  - f) In the **Consumer EPGs** area, click **Add Consumer EPGs**.  
The **Select Consumer EPGs** window appears.
  - g) Leave the **Keep selected items** box checked, then select the second tenant's (**tenant2**) EPG.
  - h) Click **Select**.  
The **EPG Communication** window appears.
  - i) Click **Save**.
- 

## Specifying Consumer and Provider EPGs Using the Cisco Cloud Network Controller

This section explains how to specify an EPG as a consumer or a provider.

### Before you begin

- You have configured a contract.
- You have configured an EPG.

- 
- Step 1** Click the **Intent** icon. The **Intent** menu appears.
- Step 2** A list of options appears in the **Intent** menu. Under **Workflows**, click **EPG Communication**. The **EPG Communication** dialog box appears with the **Consumer EPGs**, **Contract**, and **Provider EPGs** information.
- Step 3** To choose a contract:
- a) Click **Select Contract**. The **Select Contract** dialog appears.
  - b) In the pane on the left side of the **Select Contract** dialog, click to choose a contract then click **Select**. The **Select Contract** dialog box closes.
- Step 4** To add a consumer EPG:
- a) Click **Add Consumer EPGs**. The **Select Consumer EPGs** dialog appears.  
**Note** EPGs within the tenant (where the contract is created) are displayed.
  - b) In the pane on the left side of the **Select Consumer EPGs** dialog, click to place a check in a check box to choose an EPG.
- Step 5** To add a provider EPG:

- a) Click **Add Provider EPGs**. The **Select Provider EPGs** dialog appears.
 

**Note** EPGs within the tenant (where the contract is created) are displayed.
- b) In the pane on the left side of the **Select Provider EPGs** dialog, click to place a check in a check box to choose a provider EPG.
 

**Note** If the chosen contract is an Imported Contract, the provider EPG selection is disabled.
- c) When finished, click **Select**. The **Select Provider EPGs** dialog box closes, and you return to the **EPG Communication Configuration** window.
- d) Click **Save**.

## Creating a Cloud Context Profile Using the Cisco Cloud Network Controller GUI

This section explains how to create a cloud context profile using the Cisco Cloud Network Controller GUI.

### Before you begin

Create a VRF.

- Step 1** Click the **Intent** icon. The **Intent** menu appears.
- Step 2** Click the drop-down arrow below the **Intent** search box and choose **Application Management**.  
A list of **Application Management** options appear in the **Intent** menu.
- Step 3** From the **Application Management** list in the **Intent** menu, click **Create Cloud Context Profile**. The **Create Cloud Context Profile** dialog box appears.
- Step 4** Enter the appropriate values in each field as listed in the following *Cloud Context Profile Dialog Box Fields* table then continue.

**Table 11: Create Cloud Context Profile Dialog Box Fields**

Properties	Description
<b>Name</b>	Enter the name of the cloud context profile. Match the regular expression: $[a-z] ([-a-z0-9]* [a-z0-9]) ?$ This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.
<b>Tenant</b>	To choose a tenant: <ol style="list-style-type: none"> <li>a. Click <b>Select Tenant</b>. The <b>Select Tenant</b> dialog box appears.</li> <li>b. From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column then click <b>Select</b>. You return to the <b>Create Cloud Context Profile</b> dialog box.</li> </ol>
<b>Description</b>	Enter a description of the cloud context profile.



Properties	Description
<b>Settings</b>	
<b>Region</b>	To choose a region: <ol style="list-style-type: none"><li data-bbox="521 394 1208 428">a. Click <b>Select Region</b>. The <b>Select Region</b> dialog box appears.</li><li data-bbox="521 447 1523 510">b. From the <b>Select Region</b> dialog, click to choose a region in the left column then click <b>Select</b>. You return to the <b>Create Cloud Context Profile</b> dialog box.</li></ol>
<b>VRF</b>	To choose a VRF: <ol style="list-style-type: none"><li data-bbox="521 600 1159 634">a. Click <b>Select VRF</b>. The <b>Select VRF</b> dialog box appears.</li><li data-bbox="521 653 1523 716">b. From the <b>Select VRF</b> dialog box, click to choose a VRF in the left column then click <b>Select</b>. You return to the <b>Create Cloud Context Profile</b> dialog box.</li></ol>

Properties	Description
Add CIDR	<p><b>Note</b> See <a href="#">Understanding VPCs and Subnets Under Google Cloud and Cloud Context Profiles Under Cisco Cloud Network Controller</a> for more information on primary and secondary CIDRs and subnet group labels.</p> <p>To add a CIDR:</p> <ol style="list-style-type: none"> <li>a. Click <b>Add CIDR</b>. The <b>Add CIDR</b> dialog box appears.</li> <li>b. Enter the address in the <b>CIDR Block Range</b> field.</li> <li>c. Click to check (enabled) or uncheck (disabled) the <b>Primary</b> check box. <ul style="list-style-type: none"> <li>• You must have at least one primary CIDR added for each cloud context profile.</li> <li>• If you are adding additional secondary CIDRs and subnets for VPCs, leave the <b>Primary</b> box unchecked.</li> </ul> </li> <li>d. Click <b>Add Subnet</b> and enter the following information: <ul style="list-style-type: none"> <li>• In the <b>Address</b> field, enter the subnet address.</li> <li>• In the <b>Name</b> field, enter the name for this subnet.</li> <li>• In the <b>Subnet Group Label</b> field, choose one of the following: <ul style="list-style-type: none"> <li>• <b>Select Existing</b>: Click <b>Select Subnet Group Label</b>, then choose an existing subnet group label to associate with this subnet.</li> <li>• <b>Create New</b>: Enter a unique name for the subnet group label to associate with this subnet.</li> </ul> </li> </ul> </li> <li>e. In the <b>VRF</b> field, make a selection, if necessary. <ul style="list-style-type: none"> <li>• If you checked the box next to the <b>Primary</b> field, this CIDR is automatically associated with the primary VRF.</li> <li>• If you did not check the box next to the <b>Primary</b> field, you can associate this CIDR with a secondary VRF. Click the <b>X</b> next to the VRF, then click on <b>Select VRF</b> to select the secondary VRF to associate with this CIDR.</li> </ul> </li> <li>f. When finished, click <b>Add</b>.</li> </ol>

**Step 5** Click **Save** when finished.

## Configuring Virtual Machines in Google Cloud

When you configure endpoint selectors for Cisco Cloud Network Controller, you will also need to configure the virtual machines that you will need in Google Cloud that will correspond with the endpoint selectors that you configure for Cisco Cloud Network Controller.

This topic provides the requirements for configuring the virtual machines in Google Cloud. You can use these requirements to configure the virtual machines in Google Cloud either before you configure the endpoint selectors for Cisco Cloud Network Controller or afterward.

For example, assume that you are using **Custom** as the type of endpoint selector, as described in [Endpoints and Endpoint Selectors](#).

- You might go to your account in Google Cloud and create a custom tag or label in Google Cloud first, then create an endpoint selector using a custom tag or label in Cisco Cloud Network Controller afterward.
- Or you might create an endpoint selector using a custom tag or label in Cisco Cloud Network Controller first, then go to your account in Google Cloud and create a custom tag or label in Google Cloud afterward.

### Before you begin

You must configure a cloud context profile as part of the Google Cloud virtual machine configuration process. When you configure a cloud context profile, the configurations, such as the VRF and region settings, are pushed out to Google Cloud afterward.

---

**Step 1** Review your cloud context profile configuration to get the following information:

- VRF name
- Subnet information
- Google Cloud Project ID
- The resource group that corresponds to where the cloud context profile is deployed.

**Note** In addition to the information above, if you are using tag-based EPGs, you also need to know the tag names. The tag names are not available in the cloud context profile configuration.

To obtain the cloud context profile configuration information:

a) From the **Navigation** menu, choose the **Application Management** tab.

When the **Application Management** tab expands, a list of subtab options appear.

b) Choose the **Cloud Context Profiles** subtab option.

A list of the cloud context profiles that you have created for your Cisco Cloud Network Controller are displayed.

c) Select the cloud context profile that you will use as part of this Google Cloud virtual machine configuration process.

Various configuration parameters are displayed for this cloud context profile, such as the region, VRF, IP address and subnets. Use the information displayed in this window when you configure the Google Cloud virtual machine.

**Step 2** Log in to the Google Cloud portal account for the Cisco Cloud Network Controller user tenant and begin creating an Google Cloud VM using the information you gathered from the cloud context profile configuration.

**Note** For information about how to create the VM in the Google Cloud portal, see the Google Cloud documentation.

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# Creating a Backup Configuration Using the Cisco Cloud Network Controller GUI

This section explains how to create a backup configuration.

## Before you begin

Create a remote location and a scheduler, if needed.

- 
- Step 1** Click the **Intent** icon. The **Intent** menu appears.
- Step 2** Click the drop-down arrow below the **Intent** search box and choose **Operations**.  
A list of **Operations** options appear in the **Intent** menu.
- Step 3** From the **Operations** list in the **Intent** menu, click **Create Backup Configuration**. The **Create Backup Configuration** dialog box appears.
- Step 4** Enter the appropriate values in each field as listed in the following *Create Backup Configuration Dialog Box Fields* table then continue.

**Table 12: Create Backup Configuration Dialog Box Fields**

Properties	Description
<b>General</b>	
<b>Name</b>	Enter the name of the backup configuration.
<b>Description</b>	Enter a description of the backup configuration.
<b>Settings</b>	
<b>Backup Destination</b>	Choose a backup destination. <ul style="list-style-type: none"> <li>• <b>Local</b></li> <li>• <b>Remote</b></li> </ul>

Properties	Description
<b>Backup Object</b>	<p>Choose the root hierarchical content to consider for the backup</p> <ul style="list-style-type: none"> <li>• <b>Policy Universe</b></li> <li>• <b>Selector Object</b>—When chosen, this option adds the <b>Object Type</b> drop-down list and <b>Object DN</b> field. <ul style="list-style-type: none"> <li>a. From the <b>Object Type</b> drop-down list, choose from the following options: <ul style="list-style-type: none"> <li>• <b>Tenant</b>—When chosen the <b>Select Tenant</b> option appears.</li> <li>• <b>Application Profile</b>—When chosen the <b>Select Application Profile</b> option appears.</li> <li>• <b>EPG</b>—When chosen the <b>Select EPG</b> option appears.</li> <li>• <b>Contract</b>—When chosen the <b>Select Contract</b> option appears.</li> <li>• <b>Filter</b>—When chosen the <b>Select Filter</b> option appears.</li> <li>• <b>VRF</b>—When chosen the <b>Select VRF</b> option appears.</li> <li>• <b>Cloud Context Profile</b>—When chosen the <b>Select Cloud Context Profile</b> option appears.</li> </ul> </li> <li>b. Click the <b>Select &lt;object_name&gt;</b>. The <b>Select &lt;object_name&gt;</b> dialog appears.</li> <li>c. From the <b>Select &lt;object_name&gt;</b> dialog, click to choose from the options in the left column then click <b>Select</b>. You return to the <b>Create Backup Configuration</b> dialog box. <p><b>Note</b>      The <b>Object DN</b> field is automatically populated with the DN of the object it will use as root of the object tree to backup</p> </li> </ul> </li> <li>• <b>Enter DN</b>—When chosen, this option displays the <b>Object DN</b> field. <ul style="list-style-type: none"> <li>a. From the <b>Object DN</b> field, enter the DN of a specific object to use as the root of the object tree to backup.</li> </ul> </li> </ul>

Properties	Description
<b>Scheduler</b>	<ol style="list-style-type: none"> <li>a. Click <b>Select Scheduler</b> to open the <b>Select Scheduler</b> dialog and choose a scheduler from the left-side column.</li> <li>b. Click the <b>Select</b> button at the bottom-right corner when finished.</li> </ol>
<b>Trigger Backup After Creation</b>	Choose one of the following: <ul style="list-style-type: none"> <li>• <b>Yes</b>—(Default) Trigger a backup after creating the backup configuration.</li> <li>• <b>No</b>—Do not trigger a backup after creating the backup configuration.</li> </ul>

**Step 5** Click **Save** when finished.

## Creating a Tech Support Policy Using the Cisco Cloud Network Controller GUI

This section explains how to create a tech support policy.

### Before you begin

When creating a tech support policy for a remote location, you must first create the remote location.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Operations**.

A list of **Operations** options appear in the **Intent** menu.

**Step 3** From the **Operations** list in the **Intent** menu, click **Create Tech Support**. The **Create Tech Support** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Tech Support Dialog Box Fields* table then continue.

**Table 13: Create Tech Support Dialog Box Fields**

Properties	Description
<b>General</b>	
<b>Name</b>	Enter the name of the tech support policy.
<b>Description</b>	Enter a description of the tech support.
<b>Settings</b>	

Properties	Description
<b>Export Destination</b>	Choose an export destination. <ul style="list-style-type: none"> <li>• <b>Controller</b></li> <li>• <b>Remote Location</b>—When chosen the <b>Select Remote Location</b> option appears. <ol style="list-style-type: none"> <li>Click <b>Select Remote Location</b>. The <b>Select Remote Location</b> dialog box appears.</li> <li>From the <b>Select Remote Location</b> dialog, click to choose a remote location in the left column then click <b>Select</b>. You return to the <b>Create Tech Support</b> dialog box.</li> </ol> </li> </ul>
<b>Include Pre-Upgrade Logs</b>	Click to place a check in the <b>Enabled</b> check box if you want to include pre-upgrade logs in the tech support policy.

**Step 5** Click **Save** when finished.

## Creating a Scheduler Using the Cisco Cloud Network Controller GUI

This section explains how to create a scheduler, which would be in User Laptop Browser local time and will be converted to the Cisco Cloud Network Controller default UTC time.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Operations**.

A list of **Operations** options appear in the **Intent** menu.

**Step 3** From the **Operations** list in the **Intent** menu, click **Create Scheduler**. The **Create Scheduler** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Scheduler Dialog Box Fields* table then continue.

**Table 14: Create Scheduler Dialog Box Fields**

Properties	Description
<b>General</b>	
<b>Name</b>	Enter the name of the trigger scheduler policy.
<b>Description</b>	Enter a description of the trigger scheduler.
<b>Settings</b>	

Properties	Description
<p><b>Recurring Windows</b></p>	<p>Click <b>Add Recurring Window</b>. The <b>Add Recurring Window</b> dialog appears.</p> <ol style="list-style-type: none"> <li>a. From the <b>Schedule</b> drop-down list, choose from the following. <ul style="list-style-type: none"> <li>• <b>Every Day</b></li> <li>• <b>Even Days</b></li> <li>• <b>Odd Days</b></li> <li>• <b>Monday</b></li> <li>• <b>Tuesday</b></li> <li>• <b>Wednesday</b></li> <li>• <b>Thursday</b></li> <li>• <b>Friday</b></li> <li>• <b>Saturday</b></li> <li>• <b>Sunday</b></li> </ul> </li> <li>b. From the <b>Start Time</b> field, enter a time.</li> <li>c. In the <b>Maximum Concurrent Tasks</b> field, choose one of the following: <ul style="list-style-type: none"> <li>• <b>Unlimited</b>: There is no maximum number of concurrent tasks that can be enforced on the scheduler window.</li> <li>• <b>Custom</b>: In the second <b>Maximum Concurrent Tasks</b> field, enter the maximum number of tasks that can be processed concurrently. The maximum value allowed in this field is 65535.</li> </ul> </li> <li>d. In the <b>Maximum Running Time</b> field, choose one of the following: <ul style="list-style-type: none"> <li>• <b>Unlimited</b>: There is no time limit enforced on the scheduler window.</li> <li>• <b>Custom</b>: In the second <b>Maximum Running Time</b> field, enter the maximum duration of the window. The acceptable format for this field is <code>dd:hh:mm:ss</code>.</li> </ul> </li> <li>e. Click <b>Add</b> when finished.</li> </ol>



Properties	Description
Add One Time Window	<p>Click <b>Add One Time Window</b>. The <b>Add One Time Window</b> dialog appears.</p> <ol style="list-style-type: none"> <li>From the <b>Start Time</b> field, enter a date and time.</li> <li>From the <b>Maximum Concurrent Tasks</b> field, enter a number or leave the field blank to specify unlimited.</li> <li>From the <b>Maximum Running Time</b>, click to choose <b>Unlimited</b> or <b>Custom</b>.</li> <li>Click <b>Add</b> when finished.</li> </ol>

**Step 5** Click **Save** when finished.

## Creating a Remote Location Using the Cisco Cloud Network Controller GUI

This section explains how to create a remote location using the Cisco Cloud Network Controller.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Operations**.

A list of **Operations** options appear in the **Intent** menu.

**Step 3** From the **Operations** list in the **Intent** menu, click **Create Remote Location**. The **Create Remote Location** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Remote Location Dialog Box Fields* table then continue.

**Table 15: Create Remote Location Dialog Box Fields**

Properties	Description
<b>General</b>	
<b>Name</b>	Enter the name of the remote location policy.
<b>Description</b>	Enter a description of the remote location policy.
<b>Settings</b>	
<b>Hostname/IP Address</b>	Enter the hostname or IP address of the remote location
<b>Protocol</b>	Choose a protocol: <ul style="list-style-type: none"> <li>• <b>FTP</b></li> <li>• <b>SFTP</b></li> <li>• <b>SCP</b></li> </ul>

Properties	Description
Path	Enter the path for the remote location.
Port	Enter the port for the remote location.
Username	Enter a username for the remote location.
Authentication Type	When using SFTP or SCP, choose the authentication type: <ul style="list-style-type: none"> <li>• Password</li> <li>• SSH Key</li> </ul>
SSH Key Content	Enter the SSH key content.
SSH Key Passphrase	SSH key passphrase.
Password	Enter a password for accessing the remote location.
Confirm Password	Reenter the password for accessing the remote location.

**Step 5** Click **Save** when finished.

## Creating a Login Domain Using the Cisco Cloud Network Controller GUI

This section explains how to create a login domain using the Cisco Cloud Network Controller GUI.

### Before you begin

Create a provider before creating a non-local domain.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Administrative**.

A list of **Administrative** options appear in the **Intent** menu.

**Step 3** From the **Administrative** list in the **Intent** menu, click **Create Login Domain**. The **Create Login Domain** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Login Domain Dialog Box Fields* table then continue.

**Table 16: Create Login Domain Dialog Box Fields**

Properties	Description
Name	Enter the name of the login domain.
Description	Enter a description of the login domain.

Properties	Description
<b>Realm</b>	Choose a realm: <ul style="list-style-type: none"> <li>• <b>Local</b></li> <li>• <b>LDAP</b>—Requires adding providers and choosing an authentication type.</li> <li>• <b>RADIUS</b>—Requires adding providers.</li> <li>• <b>TACACS+</b>—Requires adding providers.</li> <li>• <b>SAML</b>—Requires adding providers.</li> </ul>
<b>Providers</b>	To add a provider: <ol style="list-style-type: none"> <li>a. Click <b>Add Providers</b>. The <b>Select Providers</b> dialog appears with a list of providers in the left pane.</li> <li>b. Click to choose a provider.</li> <li>c. Click <b>Select</b> to add the provider.</li> </ol>
<b>Advanced Settings</b>	Displays the <b>Authentication Type</b> and <b>LDAP Group Map Rules</b> fields.
<b>Authentication Type</b>	When LDAP is chosen for realm option, choose one of the following authentication types: <ul style="list-style-type: none"> <li>• <b>Cisco AV Pairs</b>—(Default)</li> <li>• <b>LDAP Group Map Rules</b>—Requires adding LDAP group map rules.</li> </ul>

Properties	Description
<b>LDAP Group Map Rules</b>	<p>To add an LDAP group map rule:</p> <ol style="list-style-type: none"> <li>a. Click <b>Add LDAP Group Map Rule</b>. The <b>Add LDAP Group Map Rule</b> dialog appears with a list of providers in the left pane.</li> <li>b. Enter a name for the rule in the <b>Name</b> field.</li> <li>c. Enter a description for the rule in the <b>Description</b> field.</li> <li>d. Enter a group DN for the rule in the <b>Group DN</b> field.</li> <li>e. Add security domains: <ol style="list-style-type: none"> <li>1. Click <b>Add Security Domain</b>. The <b>Add Security Domain</b> dialog box appears.</li> <li>2. Click <b>Select Security Domain</b>. The <b>Select Security Domain</b> dialog box appears with a list of security domains in the left pane.</li> <li>3. Click to choose a security domain.</li> <li>4. Click <b>Select</b> to add the security domain. You return to the <b>Add Security Domain</b> dialog box.</li> </ol> </li> <li>5. Add a user role: <ol style="list-style-type: none"> <li>a. From the <b>Add Security Domain</b> dialog box, click <b>Select Role</b>. The <b>Select Role</b> dialog box appears with a list of roles in the left pane.</li> <li>b. Click to choose a role.</li> <li>c. Click <b>Select</b> to add the role. You return to the <b>Add Security Domain</b> dialog box.</li> <li>d. From the <b>Add Security Domain</b> dialog box, click the <b>Privilege Type</b> drop-down list and choose <b>Read Privilege</b> or <b>Write Privilege</b>.</li> <li>e. Click the check mark on the right side of the <b>Privilege Type</b> drop-down list to confirm.</li> <li>f. Click <b>Add</b> when finished. You return to the <b>Add LDAP Group Map Rule</b> dialog box where you can add another security domain.</li> </ol> </li> </ol>

**Step 5** Click **Save** when finished.

## Creating a Security Domain Using the Cisco Cloud Network Controller GUI

A security domain restricts the tenant to the security domains that you add. If you do not add a security domain, all security domains will have access to this tenant. This section explains how to create a security domain using the GUI.

- 
- Step 1** Click the **Intent** icon. The **Intent** menu appears.
- Step 2** Click the drop-down arrow below the **Intent** search box and choose **Administrative**.  
A list of **Administrative** options appear in the **Intent** menu.
- Step 3** From the **Administrative** list in the **Intent** menu, click **Security > Security Domains > Create Security Domain**. The **Create Security Domain** dialog box appears.
- Step 4** In the **Name** field, enter the name of the security domain.
- Step 5** In the **Description** field, enter a description of the security domain.
- Step 6** In the **Type** field, choose the type of security domain:
- **Unrestricted:** Users who are assigned to this domain are able to see policies, profiles, or users configured in other security domains.
  - **Restricted:** Users who are assigned to this domain will not be able to see policies, profiles, or users configured in other security domains.
- Step 7** Click **Save** when finished.
- 

## Creating a Role Using the Cisco Cloud Network Controller GUI

This section explains how to create a role using the Cisco Cloud Network Controller GUI.

- 
- Step 1** Click the **Intent** icon. The **Intent** menu appears.
- Step 2** Click the drop-down arrow below the **Intent** search box and choose **Administrative**.  
A list of **Administrative** options appear in the **Intent** menu.
- Step 3** From the **Administrative** list in the **Intent** menu, click **Create Role**. The **Create Role** dialog box appears.
- Step 4** Enter the appropriate values in each field as listed in the following *Create Role Dialog Box Fields* table then continue.

**Table 17: Create Role Dialog Box Fields**

Properties	Description
<b>General</b>	
<b>Name</b>	Enter a name for the role in the <b>Name</b> field.
<b>Description</b>	Enter a description of the role.
<b>Settings</b>	

Properties	Description
Privilege	

Properties	Description
	<p>Click to place a check mark in the check boxes of the privileges you want to assign the user. The privileges are:</p> <ul style="list-style-type: none"> <li>• <b>aaa</b>—Used for configuring authentication, authorization, accounting and import/export policies.</li> <li>• <b>access-connectivity</b>—Used for Layer 1-3 configuration under infra, static route configurations under a tenant's L3Out, management infra policies, and tenant ERSPAN policies.</li> <li>• <b>access-equipment</b>—Used for access port configuration.</li> <li>• <b>access-protocol</b>—Used for Layer 1-3 protocol configurations under infra, fabric-wide policies for NTP, SNMP, DNS, and image management, and operations-related access policies such as cluster policy and firmware policies.</li> <li>• <b>access-qos</b>—Used for changing CoPP and QoS-related policies.</li> <li>• <b>admin</b>—Complete access to everything (combine ALL roles)</li> <li>• <b>config-manager</b></li> <li>• <b>custom-port-privilege</b></li> <li>• <b>custom-privilege-1 through custom-privilege-22</b></li> <li>• <b>fabric-connectivity</b>—Used for Layer 1-3 configuration under the fabric, firmware and deployment policies for raising warnings for estimating policy deployment impact, and atomic counter, diagnostic, and image management policies on leaf switches and spine switches.</li> <li>• <b>fabric-equipment</b>—Used for atomic counter, diagnostic, and image management policies on leaf switches and spine switches.</li> <li>• <b>fabric-protocol</b>—Used for Layer 1-3 protocol configurations under the fabric, fabric-wide policies for NTP, SNMP, DNS, and image management, ERSPAN and health score policies, and firmware management traceroute and endpoint tracking policies.</li> <li>• <b>none</b>—No privilege.</li> <li>• <b>nw-svc-params</b>—Used for managing Layer 4 to Layer 7 service policies.</li> <li>• <b>nw-svc-policy</b>—Used for managing Layer 4 to Layer 7 service devices and network service orchestration.</li> <li>• <b>ops</b>—Used for operational policies including monitoring and troubleshooting policies such as atomic counter, SPAN, TSW, tech support, traceroute, analytics, and core policies.</li> <li>• <b>site-admin</b></li> <li>• <b>site-policy</b></li> <li>• <b>tenant-connectivity</b>—Used for Layer 1-3 connectivity changes, including bridge domains, subnets, and VRFs; for atomic counter, diagnostic, and image management policies on leaf switches and spine switches; tenant in-band and out-of-band management</li> </ul>

Properties	Description
	<p>connectivity configurations; and debugging/monitoring policies such as atomic counters and health score.</p> <ul style="list-style-type: none"> <li>• <b>tenant-epg</b>—Used for managing tenant configurations such as deleting/creating endpoint groups, VRFs, and bridge domains.</li> <li>• <b>tenant-ext-connectivity</b>—Used for write access firmware policies; managing tenant L2Out and L3Out configurations; and debugging/monitoring/observer policies.</li> <li>• <b>tenant-ext-protocol</b>—Used for managing tenant external Layer 1-3 protocols, including BGP, OSPF, PIM, and IGMP, and for debugging/monitoring/observer policies such as traceroute, ping, oam, and eptrk. Generally only used for write access for firmware policies.</li> <li>• <b>tenant-network-profile</b>—Used for managing tenant configurations, such as deleting and creating network profiles, and deleting and creating endpoint groups.</li> <li>• <b>tenant-protocol</b>—Used for managing configurations for Layer 1-3 protocols under a tenant, for tenant traceroute policies, and as write access for firmware policies.</li> <li>• <b>tenant-qos</b>—Only used as Write access for firmware policies.</li> <li>• <b>tenant-security</b>—Used for Contract related configurations for a tenant.</li> <li>• <b>vmm-policy</b>—Used for managing policies for VM networking.</li> </ul>

**Step 5** Click **Save** when finished.

## Creating a Certificate Authority Using the Cisco Cloud Network Controller GUI

This section explains how to create a certificate authority using the GUI.

### Before you begin

- Have the certificate chain.
- If the certificate authority is for a tenant, create the tenant.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Administrative**.

A list of **Administrative** options appears in the **Intent** menu.

**Step 3** From the **Administrative** list in the **Intent** menu, click **Create Certificate Authority**. The **Create Certificate Authority** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Certificate Authority Dialog Box Fields* table then continue.



Table 18: Create Certificate Authority Dialog Box Fields

Properties	Description
<b>Name</b>	Enter the name of the certificate authority.
<b>Description</b>	Enter a description of the certificate authority.
<b>Used for</b>	Choose from the following options: <ul style="list-style-type: none"> <li>• <b>Tenant</b>—Choose if the certificate authority is for a specific tenant. When chosen, the <b>Select Tenant</b> option appears in the GUI.</li> <li>• <b>System</b>—Choose if the certificate authority is for the system.</li> </ul>
<b>Select Tenant</b>	To choose a tenant: <ol style="list-style-type: none"> <li>Click <b>Select Tenant</b>. The <b>Select Tenant</b> dialog box appears.</li> <li>From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column then click <b>Select</b>. You return to the <b>Create Certificate Authority</b> dialog box.</li> </ol>
<b>Certificate Chain</b>	Enter the certificate chain in the <b>Certificate Chain</b> text box. <p><b>Note</b> Add the certificates for a chain in the following order:</p> <ol style="list-style-type: none"> <li>CA</li> <li>Sub-CA</li> <li>Subsub-CA</li> <li>Server</li> </ol>

**Step 5** Click **Save** when finished.

## Creating a Key Ring Using the Cisco Cloud Network Controller GUI

This section explains how to create a key ring using the Cisco Cloud Network Controller GUI.

### Before you begin

- Create a certificate authority.
- Have a certificate.
- If the key ring is for a specific tenant, create the tenant.

- Step 1** Click the **Intent** icon. The **Intent** menu appears.
- Step 2** Click the drop-down arrow below the **Intent** search box and choose **Administrative**.  
A list of **Administrative** options appear in the **Intent** menu.
- Step 3** From the **Administrative** list in the **Intent** menu, click **Create Key Ring**. The **Create Key Ring** dialog box appears.
- Step 4** Enter the appropriate values in each field as listed in the following *Create Key Ring Dialog Box Fields* table then continue.

Table 19: Create Key Ring Dialog Box Fields

Properties	Description
<b>Name</b>	Enter the name of the key ring.
<b>Description</b>	Enter a description of the key ring.
<b>Used for</b>	<ul style="list-style-type: none"> <li>• <b>System</b>—The key ring is for the system.</li> <li>• <b>Tenant</b>—The key ring is for a specific tenant. Displays a <b>Tenant</b> field for specifying the tenant.</li> </ul>
<b>Select Tenant</b>	<p>To choose a tenant:</p> <ol style="list-style-type: none"> <li>a. Click <b>Select Tenant</b>. The <b>Select Tenant</b> dialog box appears.</li> <li>b. From the <b>Select Tenant</b> dialog, click to choose a tenant in the left column then click <b>Select</b>. You return to the <b>Create Key Ring</b> dialog box.</li> </ol>
<b>Settings</b>	
<b>Certificate Authority</b>	<p>To choose a certificate authority:</p> <ol style="list-style-type: none"> <li>a. Click <b>Select Certificate Authority</b>. The <b>Select Certificate Authority</b> dialog appears.</li> <li>b. Click to choose a certificate authority in the column on the left.</li> <li>c. Click <b>Select</b>. You return to the <b>Create Key Ring</b> dialog box.</li> </ol>
<b>Private Key</b>	<p>Choose one of the following:</p> <ul style="list-style-type: none"> <li>• <b>Generate New Key</b>—Generates a new key.</li> <li>• <b>Import Existing Key</b>—Displays the <b>Private Key</b> text box and enables you to use an existing key.</li> </ul>
<b>Private Key</b>	Enter an existing key in the <b>Private Key</b> text box (for the <b>Import Existing Key</b> option).

Properties	Description
<b>Modulus</b>	Click the <b>Modulus</b> drop-down list to choose from the following: <ul style="list-style-type: none"> <li>• <b>MOD 512</b></li> <li>• <b>MOD 1024</b></li> <li>• <b>MOD 1536</b></li> <li>• <b>MOD 2048</b>—(Default)</li> </ul>
<b>Certificate</b>	Enter the certificate information in the <b>Certificate</b> text box.

**Step 5** Click **Save** when finished.

## Creating a Local User Using the Cisco Cloud Network Controller GUI

This section explains how to create a local user using the Cisco Cloud Network Controller GUI.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** Click the drop-down arrow below the **Intent** search box and choose **Administrative**.

A list of **Administrative** options appear in the **Intent** menu.

**Step 3** From the **Administrative** list in the **Intent** menu, click **Create Local User**. The **Create Local User** dialog box appears.

**Step 4** Enter the appropriate values in each field as listed in the following *Create Local User Dialog Box Fields* table then continue.

*Table 20: Create Local User Dialog Box Fields*

Properties	Description
<b>Username</b>	Enter the username of the local user.
<b>Password</b>	Enter the password for the local user.
<b>Confirm Password</b>	Reenter the password for the local user.
<b>Description</b>	Enter a description of the local user.
<b>Settings</b>	
<b>Account Status</b>	To choose the account status: <ul style="list-style-type: none"> <li>• <b>Active</b>—Activates the local user account.</li> <li>• <b>Blocked</b>—Blocks the local user account.</li> <li>• <b>Inactive</b>—Deactivates the local user account.</li> </ul>

Properties	Description
<b>First Name</b>	Enter the first name of the local user.
<b>Last Name</b>	Enter the last name of the local user.
<b>Email Address</b>	Enter the email address of the local user.
<b>Phone Number</b>	Enter the phone number of the local user.
<b>Security Domains</b>	<p>To add a security domain:</p> <ol style="list-style-type: none"> <li>a. Click <b>Add Security Domain</b>. The <b>Add Security Domain</b> dialog box appears.</li> <li>b. Click <b>Select Security Domain</b>. The <b>Select Security Domain</b> dialog box appears with a list of security domains in the left pane.</li> <li>c. Click to choose a security domain.</li> <li>d. Click <b>Select</b> to add the security domain. You return to the <b>Add Security Domain</b> dialog box.</li> <li>e. Add a user role: <ol style="list-style-type: none"> <li>1. From the <b>Add Security Domain</b> dialog box, click <b>Select Role</b>. The <b>Select Role</b> dialog box appears with a list of roles in the left pane.</li> <li>2. Click to choose a role.</li> <li>3. Click <b>Select</b> to add the the role. You return to the <b>Add Security Domain</b> dialog box.</li> <li>4. From the <b>Add Security Domain</b> dialog box, click the <b>Privilege Type</b> drop-down list and choose <b>Read Privilege</b> or <b>Write Privilege</b>.</li> <li>5. Click the check mark on the right side of the <b>Privilege Type</b> drop-down list to confirm.</li> <li>6. Click <b>Add</b> when finished. You return to the <b>Create Local User</b> dialog box where you can add another security domain.</li> </ol> </li> </ol>

**Step 5** Click **Advanced Settings** and enter the appropriate values in each field as listed in the following *Create Local User Dialog Box Fields: Advanced Settings* table then continue.

**Table 21: Create Local User Dialog Box Fields: Advanced Settings**

Property	Description
<b>Account Expires</b>	If you choose <b>Yes</b> , the account is set to expire at the time that you choose.

Property	Description
<b>Password Update Required</b>	If you choose <b>Yes</b> , the user must change the password upon the next login.
<b>OTP</b>	Put a check in the box to enable the one-time password feature for the user.
<b>User Certificate Attribute</b>	The attribute for the user certificate.
<b>User Certificates</b>	To add a user certificate: <ul style="list-style-type: none"> <li>a. Click <b>Add X509 Certificate</b>. The <b>Add X509 Certificate</b> dialog box appears.</li> <li>b. Enter a name in the <b>Name</b> field.</li> <li>c. Enter the X509 certificate in the <b>User X509 Certificate</b> text box.</li> <li>d. Click <b>Add</b>. The <b>X509 certificate in the User X509 Certificate</b> dialog box closes. You return to the <b>Local User</b> dialog box.</li> </ul>
<b>SSH Keys</b>	To add an SSH key: <ul style="list-style-type: none"> <li>a. Click <b>Add SSH Key</b>. The <b>Add SSH Key</b> dialog box appears.</li> <li>b. Enter a name in the <b>Name</b> field.</li> <li>c. Enter the SSH key in the <b>Key</b> text box.</li> <li>d. Click <b>Add</b>. The <b>Add SSH Key</b> dialog box closes. You return to the <b>Local User</b> dialog box.</li> </ul>

**Step 6** Click **Save** when finished.

## Managing Regions (Configuring a Cloud Template) Using the Cisco Cloud Network Controller GUI

With Google Cloud, the VPC resource is a global resource, which means that it spans all Google Cloud regions. By default, all regions are managed by Google Cloud and inter-region connectivity is present. Cisco Cloud Network Controller manages all 25 Google Cloud regions.

**Step 1** Click the **Intent** icon. The **Intent** menu appears.

**Step 2** A list of options appear in the **Intent** menu. Under **Workflows**, click **Cisco Cloud Network Controller Setup**. The **Set up- Overview** dialog box appears with options for **DNS and NTP Servers**, **Region Management**, **Advanced Settings**, and **Smart Licensing**.

**Step 3** For **Region Management**, click **Edit Configuration**.

The **Region Management** window appears.

**Step 4** Determine if you want to configure external connectivity.

Click the box next to **Enable** to enable external connectivity.

**Step 5** Verify that all of the regions in the page are selected.

This page shows all of the regions that are supported by Google Cloud. All of the regions are managed by Cisco Cloud Network Controller.

**Step 6** Click **Next** at the bottom of the page.

If you enabled external connectivity, the **General Connectivity** page appears.

**Step 7** Enter the necessary information in the **Hub Network** area.

Hub network management is used to deploy cloud routers on specific managed regions. Configure the fabric infra connectivity for the cloud site and define the configuration template used for the cloud routers in the cloud site in this area.

Note the following restrictions:

- You can create only one hub network in Google Cloud.
- Under the hub network, only one cloud router is created in Google Cloud.

a) In the **Hub Network** area, click **Add Hub Network**.

The **Add Hub Network** window appears.

b) In the **Name** field, enter a name for the hub network.

c) Enter a value in the **BGP Autonomous System Number** field.

The BGP Autonomous System Number (ASN) is used for BGP peering inside the cloud site and for MP-BGP IPv4 peering to other sites.

The ASN must be a private ASN. Enter a value between 64512 and 65534 or between 4200000000 and 4294967294, inclusive, for each hub network, then click the check mark next to the field.

d) In the **Region** field, select the appropriate regions.

You can add up to four regions to deploy hub network in this area. The hub network will create one cloud router in each region selected.

e) In the **VPN Router** field, enter a name for the VPN router.

The infra VPC uses the cloud router and VPN Gateway to create IPsec tunnels and BGP sessions to on-premises sites or other cloud sites. The spoke VPCs peer with the infra VPC to share the VPN connections to external sites.

**Step 8** Enter the necessary information in the **IPSec Tunnel Subnet Pools** area.

a) In the **IPSec Tunnel Subnet Pools** area, click **Add IPSec Tunnel Subnet Pools**.

The **Add IPSec Tunnel Subnet Pools** window appears.

b) Enter the subnet pool to be used for IPsec tunnels, if necessary.

By default, a subnet pool of 169.254.0.0/16 is populated to create the IPsec tunnels. You can delete the existing subnet pool and add additional subnet pools, if necessary.

The subnets used for the **IPSec Tunnel Subnet Pools** entry must be common /30 CIDRs from the 169.254.0.0/16 block. For example, 169.254.7.0/24 and 169.254.8.0/24 would be acceptable entries for the subnet pools in this field.

Click the check mark after you have entered in the appropriate subnet pools.

- Step 9** When you have entered all the necessary information on this page, click **Save and Continue** at the bottom of the page. You are given the option to create external networks and complete external connectivity configurations, if necessary. Go to [Creating an External Network Using Cloud Native Routers Using the Cisco Cloud Network Controller GUI](#), on page 11 for those procedures.

# Configuring Cisco Cloud Network Controller Using the REST API

## Creating a Tenant Using the REST API

### Before you begin

Review the information provided in [Understanding Google Cloud Deployments with Cisco Cloud Network Controller](#) before proceeding with the procedures in this section.

- Step 1** Enter the following POST to share the same credentials across multiple tenants, where you are duplicating the `cloudCredentials` object in each tenant and specifying the same Google Cloud Service Account.

Note the following:

- Tenant `T1` defines the `cloudCredentials` object that carries the private key for the Service Account.
- Both tenant `T1` and `T2` then refer to this `cloudCredentials` object through the `cloudRsCredentials` relation.
- The Service Account defined by tenant `T1` must be a member of Google Cloud Projects `project1` and `project2` in this scenario.
- The highlighted areas in the POST for tenant `T2` show the credentials that are shared with the first user tenant

**Note** Beginning with 26.0(2), support is now available for having multiple cloud accounts under a single tenant. For more information, see [“Support for Multiple Cloud Accounts Under a Single Tenant”](#).

```
POST https://<cloud-network-controller-ip-address>/api/mo/uni.xml

<fvTenant name="T1">
  <cloudAccount id="project1" vendor="gcp" accessType="credentials" >
    <cloudRsCredentials tDn="uni/tn-T1/credentials-creds1" />
  </cloudAccount>
  <cloudCredentials name="creds1" keyId="de22albc-7872-4651-9d09-c5d820af7e1c"
rsaPrivateKey="-----BEGIN ... -----END PRIVATE KEY-----\n" clientId="28763876"
email="cnc-395@project2.iam.gserviceaccount.com"/>
  <fvRsCloudAccount tDn="uni/tn-T1/acct-[project1]-vendor-gcp"/>

```

```

</fvTenant>

<fvTenant name="T2">
  <cloudAccount id="project2" vendor="gcp" accessType="credentials" >
    <cloudRsCredentials tDn="uni/tn-T2/credentials-creds1" />
  </cloudAccount>
  <cloudCredentials name="creds1" keyId="de22a1bc-7872-4651-9d09-c5d820af7e1c"
rsaPrivateKey="-----BEGIN ... -----END PRIVATE KEY-----\n" clientId="28763876"
email="cnc-395@project2.iam.gserviceaccount.com"/>
  <fvRsCloudAccount tDn="uni/tn-T2/acct-[project2]-vendor-gcp"/>
</fvTenant>

```

**Step 2** To create a user tenant where the Cisco Cloud Network Controller runs outside of Google Cloud (the infra tenant with credentials):

Note that the new properties added specifically for Google Cloud are highlighted below.

POST https://<cloud-network-controller-ip-address>/api/mo/uni.xml

```

<fvTenant name="infra">
  <cloudAccount id="project1" vendor="gcp" accessType="credentials" >
    <cloudRsCredentials tDn="uni/tn-infra/credentials-creds1" />
  </cloudAccount>
  <cloudCredentials name="creds1" keyId="de22a1bc-7872-4651-9d09-c5d820af7e1c"
rsaPrivateKey="-----BEGIN ... -----END PRIVATE KEY-----\n" clientId="28763876"
email="cnc-395@project2.iam.gserviceaccount.com"/>
  <fvRsCloudAccount tDn="uni/tn-infra/acct-[project1]-vendor-gcp"/>
</fvTenant>

<fvTenant name="T2">
  <cloudAccount id="project2" vendor="gcp" accessType="credentials" >
    <cloudRsCredentials tDn="uni/tn-infra/credentials-creds1" />
  </cloudAccount>
  <fvRsCloudAccount tDn="uni/tn-T2/acct-[project2]-vendor-gcp"/>
</fvTenant>

```

**Step 3** To create a managed user tenant where the user shares the infra service account across multiple Google Cloud projects:

POST https://<cloud-network-controller-ip-address>/api/mo/uni.xml

```

<fvTenant name="infra">
  <cloudAccount id="project1" vendor="gcp" accessType="managed" />
  <fvRsCloudAccount tDn="uni/tn-infra/acct-[project1]-vendor-gcp"/>
</fvTenant>

<fvTenant name="T2">
  <cloudAccount id="project2" vendor="gcp" accessType="managed" />
  <fvRsCloudAccount tDn="uni/tn-T2/acct-[project2]-vendor-gcp"/>
</fvTenant>

```

**Step 4** To create a multi account tenant :

```

POST https://<cloud-network-controller-ip-address>/api/mo/uni.xml
<fvTenant name="gcp-tenant" status="">
  <cloudAccount id="gcp-222222222222" vendor="gcp" accessType="credentials">
    <cloudRsCredentials tDn="uni/tn-gcp-tenant/credentials-creds1" />
  </cloudAccount>
  <cloudCredentials
    name="creds1"
    keyId="xxxxx"
    rsaPrivateKey="xxxxx"
    clientId="222222222222"
  >
</fvTenant>

```



```

        email=capic-testing@gcp-222222222222.iam.gserviceaccount.com
    />
    <fvRsCloudAccount tDn="uni/tn-gcp-tenant/act-[gcp-222222222222]-vendor-gcp" />
    <cloudAccount id="gcp-333333333333" vendor="gcp" accessType="credentials" status="">
        <cloudRsCredentials tDn="uni/tn-gcp-tenant/credentials-creds2" status="" />
    </cloudAccount>
    <cloudCredentials
        name="creds2"
        keyId="xxxx"
        rsaPrivateKey="xxxx"
        clientId="44444444444444"
        email=pmatetyacc@gcp-333333333333.iam.gserviceaccount.com/>

    <fvCtx name="vrf20"/>
    <cloudCtxProfile name="vrf20-us-west2-2" vpcGroup="gcp-tenant-vrf20" status="">
        <cloudRsToCtx tnFvCtxName="vrf20"/>
        <cloudRsCtxProfileToRegion tDn="uni/clouddomp/provp-gcp/region-us-west2" />
        <cloudRsCtxProfileToGatewayRouterP tDn="uni/tn-infra/gwrouterp-default" status=""/>
        <cloudCidr addr="43.10.0.0/16" primary="yes">
            <cloudSubnet ip="43.10.10.0/24" name="1" subnetGroup="vrf20-us-west2-s1">
                <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-west2/zone-default" />
            </cloudSubnet>
            <cloudSubnet ip="43.10.20.0/24" name="2" subnetGroup="vrf20-us-west2-s2">
                <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-west2/zone-default"/>
            </cloudSubnet>
            <cloudSubnet ip="43.10.30.0/24" name="3" subnetGroup="who">
                <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-west2/zone-default"/>
            </cloudSubnet>
        </cloudCidr>
    </cloudCtxProfile>

```

### Step 5 Add cloud context profile to non default account

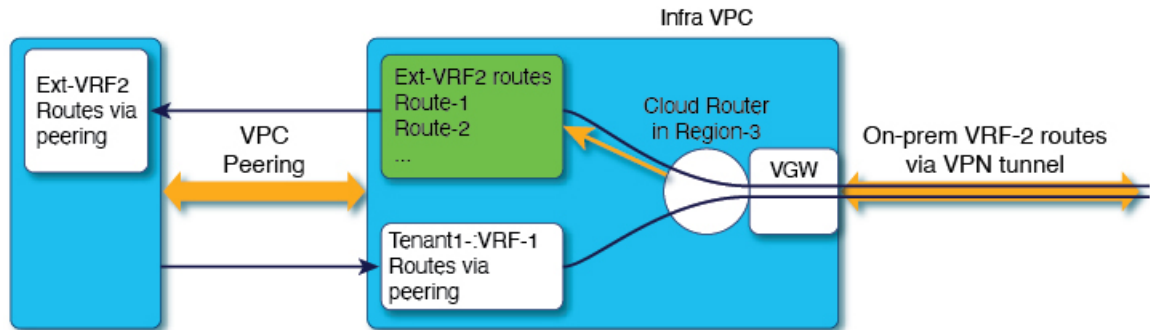
```

    <cloudCtxProfile name="vrf20-us-east4-2" vpcGroup="gcp-tenant-vrf20" status="">
        <cloudRsToCtx tnFvCtxName="vrf20"/>
        <cloudRsCtxProfileToAccount tDn="uni/tn-gcp-tenant/act-[gcp-333333333333]-vendor-gcp"
status=""/>
        <cloudRsCtxProfileToRegion tDn="uni/clouddomp/provp-gcp/region-us-east4" />
        <cloudRsCtxProfileToGatewayRouterP tDn="uni/tn-infra/gwrouterp-default" status=""/>
        <cloudCidr addr="63.21.0.0/16" primary="yes">
            <cloudSubnet ip="63.21.11.0/24" name="1" subnetGroup="vrf20-us-east4-s1">
                <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-east4/zone-default" />
            </cloudSubnet>
            <cloudSubnet ip="63.21.12.0/24" name="3" subnetGroup="who">
                <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-east4/zone-default"/>
            </cloudSubnet>
        </cloudCidr>
        <cloudCidr addr="63.22.0.0/16" primary="no">
            <cloudSubnet ip="63.22.11.0/24" name="1" subnetGroup="vrf20-us-east4-s1">
                <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-east4/zone-default" />
            </cloudSubnet>
            <cloudSubnet ip="63.22.12.0/24" name="3" subnetGroup="who">
                <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-east4/zone-default"/>
            </cloudSubnet>
        </cloudCidr>
    </cloudCtxProfile>

```

## Configuring Inter-VRF Route Leaking Using the REST API

This example demonstrates how to configure leak routes for the Cisco Cloud Network Controller using the REST API. This example shows how to configure inter-VRF route leaking, between an external VRF and a cloud VRF, as shown in the following figure.



### Subnet1 (Region-1) Route-Table

CIDR1 (Region-1) - 100.100.0.0/16  
Subnet1 - 100.100.100.0/24

100.100.0.0/16 -> Local  
50.50.0.0/16 -> Infra-VPC

Leak-All-routes to  
Tenant-Infra:Ext-RF-2

503853

To configure inter-VRF route leaking for this example:

### Example:

```
<polUni>
  <fvTenant name="t1">
    <fvCtx name="VRF1">
      <leakRoutes>
        <leakInternalPrefix ip="0.0.0.0/0" status="">
          <leakTo tenantName="infra" ctxName="Ext-VRF2" scope="public" status=""/>
        </leakInternalPrefix>
      </leakRoutes>
    </fvCtx>
    <cloudCtxProfile name="v1-us-west1" type="regular" vpcGroup="one" status="">
      <cloudRsToCtx tnFvCtxName="VRF1"/>
      <cloudRsCtxProfileToRegion tDn="uni/clouddomp/provp-gcp/region-us-west1"/>
      <cloudCidr addr="100.100.0.0/16" primary="yes">
        <cloudSubnet ip="100.100.100.0/20" scope="public,shared" subnetGroup="one">
          <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-west1/zone-default"/>
        </cloudSubnet>
      </cloudCidr>
    </cloudCtxProfile>
  </fvTenant>
  <fvTenant name="infra" status="">
    <fvCtx name="Ext-VRF2">
      <leakRoutes>
        <leakExternalPrefix ip="0.0.0.0/0" status="">
          <leakTo tenantName="t1" ctxName="VRF1" scope="public" status=""/>
        </leakExternalPrefix>
      </leakRoutes>
    </fvCtx>
  </fvTenant>
```

```

    </fvCtx>
  </fvTenant>
</polUni>

```

## Creating a Filter Using the REST API

This section demonstrates how to create a filter using the REST API.

To create a filter:

```

https://<IP_Address>/api/node/mo/.xml
<?xml version="1.0" encoding="UTF-8"?>
<!-- api/node/mo/uni/.xml -->
<polUni>
  <fvTenant name="t15">
    <vzFilter name="rule1">
      <vzEntry etherT="ip" dToPort="22" prot="tcp" dFromPort="22" name="ssh"/>
      <vzEntry etherT="ip" prot="unspecified" name="any"/>
    </vzFilter>
    <vzFilter name="rule2">
      <vzEntry etherT="ip" dToPort="http" prot="tcp" dFromPort="http" name="http"/>
    </vzFilter>
    <vzFilter name="rule3">
      <vzEntry etherT="ip" dToPort="22" prot="tcp" dFromPort="22" name="ssh"/>
    </vzFilter>
    <vzFilter name='all_rule'>
      <vzEntry etherT="ip" prot="unspecified" name="any"/>
    </vzFilter>

    <vzBrCP name="c1">
      <vzSubj name="c1">
        <vzRsSubjFiltAtt tnVzFilterName="rule2"/>
        <vzRsSubjGraphAtt tnVnsAbsGraphName="c13_g1"/>
        <vzRsSubjFiltAtt tnVzFilterName="rule3"/>
        <vzRsSubjFiltAtt tnVzFilterName="all_rule"/>
      </vzSubj>
    </vzBrCP>

  </fvTenant>
</polUni>

```

## Creating a Contract Using the REST API

This example demonstrates how to create a contract for the Cisco Cloud Network Controller using the REST API.

### Before you begin

Create filters.

To create a contract:

```

<polUni>
  <fvTenant name="t2" status="">
    <vzFilter descr="" name="http-family-destination" ownerKey="" ownerTag="">
      <vzEntry name="http" prot="tcp" etherT="ip" dFromPort="http" dToPort="http"/>
      <vzEntry name="https" prot="tcp" etherT="ip" dFromPort="https" dToPort="https"/>
    </vzFilter>
    <vzBrCP name="httpFamily">
      <vzSubj name="default" revFltPorts="yes" targetDscp="unspecified">
        <vzRsSubjFiltAtt action="permit" directives="" tnVzFilterName="http-family-destination"/>
      </vzSubj>
    </vzBrCP>
  </fvTenant>
</polUni>

```

Note the following restrictions for the name of the contract (the `vzBrCP` entry):

- Match the regular expression:

```
[a-z]([-a-z0-9]*[a-z0-9])?
```

This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.

- We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to [Naming Length Restrictions Imposed By Google Cloud Firewall Rules](#) to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.

## Creating a Cloud Context Profile Using the REST API

This section demonstrates how to create a cloud context profile.

### Before you begin

Create a VRF.

**Step 1** To create a basic cloud context profile:

#### Example:

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- api/node/mo/uni/.xml -->
<polUni>
  <fvTenant name="tn15">
    <cloudCtxProfile name="cProfilewest1151">
      <cloudRsCtxProfileToRegion tDn="uni/clouddomp/provp-gcp/region-us-west1"/>
      <cloudRsToCtx tnFvCtxName="ctx151"/>
      <cloudCidr addr="15.151.0.0/16" primary="true" status="">
        <cloudSubnet ip="15.151.1.0/24" name="GatewaySubnet" usage="gateway">
          <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-west1/zone-default"/>
        </cloudSubnet>
        <cloudSubnet ip="15.151.2.0/24" name="albsubnet" >
          <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-west1/zone-default"/>
        </cloudSubnet>
        <cloudSubnet ip="15.151.3.0/24" name="subnet" usage="">
          <cloudRsZoneAttach tDn="uni/clouddomp/provp-gcp/region-us-west1/zone-default"/>
        </cloudSubnet>
      </cloudCidr>
    </cloudCtxProfile>
  </fvTenant>
</polUni>

```

```

    </cloudCidr>
  </cloudCtxProfile>
</fvTenant>
</polUni>

```

**Step 2** To create a cloud context profile where you are adding a secondary VRF, CIDR, and subnet for a VNet:

**Example:**

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- api/node/mo/uni/.xml -->
<polUni>
  <fvTenant name="tenant1" status="">
    <fvCtx name="VRF1" />
    <fvCtx name="VRF2" />
    <cloudCtxProfile name="vpcl" status="">
      <cloudRsCtxProfileToRegion tDn="uni/clouddomp/provp-gcp/region-us-centrall1" status=""/>
      <cloudRsToCtx tnFvCtxName="VRF1" />
      <cloudRsCtxProfileToGatewayRouterP tDn="uni/tn-infra/gwrouterp-default" status=""/>
      <cloudCidr name="cidr1" addr="192.0.2.0/16" primary="yes" status="">
        <cloudSubnet ip="192.0.3.0/24" usage="gateway" status="">
          <cloudRsZoneAttach status=""
tDn="uni/clouddomp/provp-gcp/region-us-centrall1/zone-default"/>
        </cloudSubnet>
      </cloudCidr>
      <cloudCidr name="cidr1" addr="193.0.2.0/16" primary="no" status="">
        <cloudSubnet ip="193.0.3.0/24" usage="" status="">
          <cloudRsSubnetToCtx tnFvCtxName="VRF2"/>
          <cloudRsZoneAttach status=""
tDn="uni/clouddomp/provp-gcp/region-us-centrall1/zone-default"/>
        </cloudSubnet>
      </cloudCidr>
    </cloudCtxProfile>
  </fvTenant>
</polUni>

```

## Creating an Application Profile Using the REST API

This section demonstrates how to create an application profile using the REST API.

### Before you begin

Create a tenant.

To create an application profile:

```

https://<IP_Address>/api/node/mo/.xml
<?xml version="1.0" encoding="UTF-8"?>
<!-- api/node/mo/uni/.xml -->
<polUni>
  <fvTenant name="tn15">
    <fvRsCloudAccount tDn="uni/tn-infra/act-[<gcp-id>]-vendor-gcp" />

    <fvCtx name="ctx151"/>

```

```

    <cloudVpnGwPol name="VgwPol1"/>
    <cloudApp name="a1">

    </cloudApp>

  </fvTenant>
</polUni>

```

For the application profile name, note the following restrictions:

- Match the regular expression:

```
[a-z]([-a-z0-9]*[a-z0-9])?
```

This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.

- We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to [Naming Length Restrictions Imposed By Google Cloud Firewall Rules](#) to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.

## Creating an EPG Using the REST API

Use the procedures in this section to create an application EPG or an external EPG using the REST API.

### Creating a Cloud EPG Using the REST API

This example demonstrates how to create a cloud EPG using the REST API.

#### Before you begin

Create an application profile and a VRF.

To create a cloud EPG:

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- api/node/mo/uni/.xml -->
<polUni>
  <fvTenant name="tn15">
    <fvRsCloudAccount tDn="uni/tn-infra/act-[<gcp-id>]-vendor-gcp" />

    <fvCtx name="ctx151"/>

    <cloudVpnGwPol name="VgwPol1"/>
    <cloudApp name="a1">

    <cloudEPg name="epg1">
      <cloudRsCloudEPgCtx tnFvCtxName="ctx151"/>
      <cloudEPSelector matchExpression="custom:tag1=='value1'" name="selector-1"/>
    </cloudEPg>
  </fvTenant>
</polUni>

```

```

    </cloudApp>

  </fvTenant>
</polUni>

```

Note the following restrictions:

- Match the regular expression:

```
[a-z]([-a-z0-9]*[a-z0-9])?
```

This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.

- We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to [Naming Length Restrictions Imposed By Google Cloud Firewall Rules](#) to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.

## Creating an External Cloud EPG Using the REST API

This example demonstrates how to create an external cloud EPG using the REST API.

For the name of the external EPG, note the following restrictions:

- Match the regular expression:

```
[a-z]([-a-z0-9]*[a-z0-9])?
```

This means that the first character must be a lowercase letter, and all the following characters must be hyphens, lowercase letters, or digits, except the last character, which cannot be a hyphen.

- We recommend using 14 characters or fewer for this name, if possible, due to the restrictions imposed by the Google Cloud firewall rules. Refer to [Naming Length Restrictions Imposed By Google Cloud Firewall Rules](#) to better understand the restriction and the total number of characters allowed for each of the Cisco Cloud Network Controller components that make up the firewall rule name.

### Before you begin

Create an application profile and a VRF.

**Step 1** To create an external cloud EPG:

#### Example:

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- api/node/mo/uni/.xml -->
<polUni>
  <fvTenant name="tn15">
    <fvRsCloudAccount tDn="uni/tn-infra/act-[<gcp-id>]-vendor-gcp" />
    <fvCtx name="ctx151"/>
    <cloudVpnGwPol name="VgwPol1"/>
    <cloudApp name="a1">
      <cloudExtEPg routeReachability="internet" name="extEpg-1">
        <fvRsCons tnVzBrCPName="extEpg-1"/>
        <cloudRsCloudEPgCtx tnFvCtxName="ctx151"/>
        <cloudExtEPSelector name="extSelector1" subnet="0.0.0.0/0"/>
      </cloudExtEPg>
    </cloudApp>
  </fvTenant>
</polUni>

```

```

    </cloudExtEPg>
  </cloudApp>
</fvTenant>
</polUni>

```

**Step 2** To create an external cloud EPG with type **site-external**, or an infra L3Out EPG:

**Example:**

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- api/node/mo/uni/.xml -->
<polUni>
  <fvTenant name="infra">
    <cloudApp name="a1">
      <cloudExtEPg routeReachability="site-ext" name="extEpg-1">
        <fvRsCons tnVzBrCPName="extEpg-1"/>
        <cloudRsCloudEPgCtx tnFvCtxName="ctx152"/>
        <cloudExtEPSelector name="extSelector1" subnet="10.100.0.0/16"/>
      </cloudExtEPg>
    </cloudApp>
  </fvTenant>
</polUni>

```

## Creating Cloud Routers, External Networks, and External VRFs Using the REST API

This section demonstrates how to create cloud routers, external networks, and external VRFs using the REST API.

Following is an example POST that shows how to bring up the cloud router in four regions and add an external network with an external VRF in each region.

```

<polUni>
  <fvTenant name="infra" status="">
    <fvCtx name="extv1" pcEnfPref="enforced" status="" />
    <fvCtx name="extv2" pcEnfPref="enforced" status="" />
    <fvCtx name="extv3" pcEnfPref="enforced" status="" />

    <cloudtemplateInfraNetwork name="default" vrfName="overlay-1" hostRouterMode="manual"
status="">
      <cloudtemplateIpSecTunnelSubnetPool subnetpool= "169.254.7.0/24" poolname="pool1" />
      <cloudtemplateIpSecTunnelSubnetPool subnetpool= "169.254.8.0/24" poolname="pool2" />
      <cloudtemplateIpSecTunnelSubnetPool subnetpool= "169.254.10.0/24" poolname="pool3" />

      <cloudtemplateHubNetwork name="default" status="" >
        <cloudtemplateHubNetworkName name="fool" asn="64514" status="">
          <cloudRegionName provider="gcp" region="us-west4" status="" />
          <cloudRegionName provider="gcp" region="us-west2" status="" />
          <cloudRegionName provider="gcp" region="us-east1" status="" />
          <cloudRegionName provider="gcp" region="us-west1" status="" />
        </cloudtemplateHubNetworkName>
      </cloudtemplateHubNetwork>

      <cloudtemplateIntNetwork name="default">
        <cloudRegionName provider="gcp" region="us-west1">
          <cloudtemplateVpnRouter name="default" status="" />
        </cloudRegionName>
      </cloudtemplateIntNetwork>
    </cloudtemplateInfraNetwork>
  </fvTenant>
</polUni>

```



```

        </cloudRegionName>
        <cloudRegionName provider="gcp" region="us-west2">
          <cloudtemplateVpnRouter name="default" status=""/>
        </cloudRegionName>
        <cloudRegionName provider="gcp" region="us-east1">
          <cloudtemplateVpnRouter name="default" status=""/>
        </cloudRegionName>
        <cloudRegionName provider="gcp" region="us-west4">
          <cloudtemplateVpnRouter name="default" status=""/>
        </cloudRegionName>
      </cloudtemplateIntNetwork>

      <cloudtemplateExtNetwork name="default">
    </cloudtemplateExtNetwork>
      <cloudtemplateExtNetwork name="extnwfoo1" vrfName="extv1" hubNetworkName="foo1"
vpnRouterName="default" status="">
        <cloudRegionName provider="gcp" region="us-west1" status=""/>
        <cloudtemplateVpnNetwork name="onprem01" remoteSiteId="1" status="">
          <cloudtemplateIpSecTunnel peeraddr="128.1.1.1" preSharedKey="abcd" poolname="pool1"
status="">
            <cloudtemplateBgpIpv4 peeraddr="0.0.0.0/0" peerasn="64529" status=""/>
          </cloudtemplateIpSecTunnel>
        </cloudtemplateVpnNetwork>
      </cloudtemplateExtNetwork>
      <cloudtemplateExtNetwork name="extnwfoo2" vrfName="extv2" hubNetworkName="foo1"
vpnRouterName="default" status="">
        <cloudRegionName provider="gcp" region="us-west2" status=""/>
        <cloudtemplateVpnNetwork name="onprem02" remoteSiteId="2" status="">
          <cloudtemplateIpSecTunnel peeraddr="128.1.1.2" preSharedKey="def"
poolname="pool2" status="">
            <cloudtemplateBgpIpv4 peeraddr="0.0.0.0/0" peerasn="64529" status=""/>
          </cloudtemplateIpSecTunnel>
        </cloudtemplateVpnNetwork>
      </cloudtemplateExtNetwork>
      <cloudtemplateExtNetwork name="extnwfoo3" vrfName="extv3" hubNetworkName="foo1"
vpnRouterName="default" status="">
        <cloudRegionName provider="gcp" region="us-east1" status=""/>
        <cloudtemplateVpnNetwork name="onprem03" remoteSiteId="3" status="">
          <cloudtemplateIpSecTunnel peeraddr="128.1.1.3" preSharedKey="abc"
poolname="pool3" status="">
            <cloudtemplateBgpIpv4 peeraddr="0.0.0.0/0" peerasn="64529" status=""/>
          </cloudtemplateIpSecTunnel>
        </cloudtemplateVpnNetwork>
      </cloudtemplateExtNetwork>
    </cloudtemplateInfraNetwork>
  </fvTenant>
</polUni>

```

