Cisco Cloud Network Controller for Google Cloud Installation Guide, Release 25.0(5)

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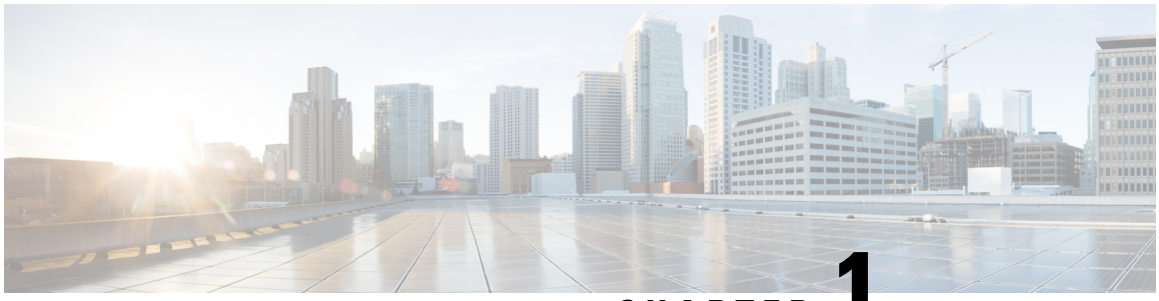


CHAPTER 1

New and Changed Information

• New and Changed Information, on page 1

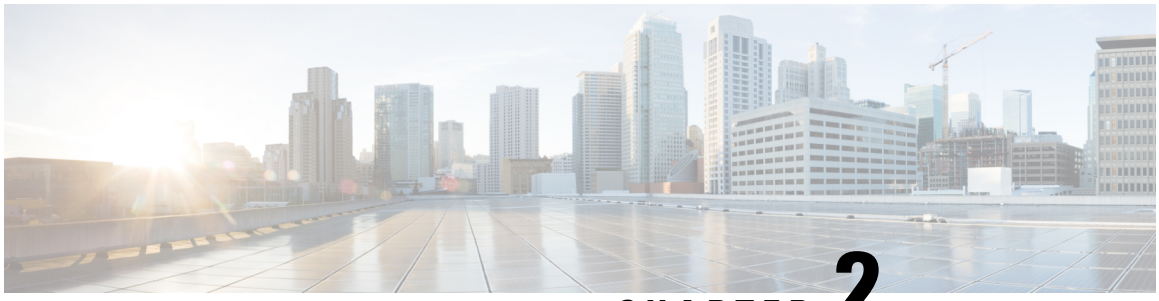
New and Changed Information

The following table provides an overview of the significant changes to the organization and features in this guide up to this current release. The table does not provide an exhaustive list of all changes made to the guide or of the new features up to this release.

Table 1: New Features and Changed Behavior in Cisco Cloud Network Controller for Release 25.0(5)

Feature or Change	Description	Where Documented
Product name change	Beginning with release 25.0(5), the Cisco Cloud APIC is renamed to Cisco Cloud Network Controller.	
Support for configuring a BGP-EVPN connection for inter-site connectivity	Beginning with release 25.0(5), for inter-site use cases, support is available for configuring a BGP-EVPN connection for inter-site connectivity between a Google Cloud site and other cloud sites or an ACI on-premises site, where Cisco Catalyst 8000Vs are used for the BGP-EVPN connection.	

New and Changed Information



CHAPTER 2

Overview

- Policy Terminology, on page 3
- Cisco Cloud Network Controller Licensing, on page 3
- Cisco Cloud Network Controller-Related Documentation, on page 4

Policy Terminology

A key feature of Cisco Cloud Network Controller is translation of Cisco Application Centric Infrastructure (ACI) policy to the native constructs of the public cloud.

The following table lists Cisco ACI policy terms and the equivalent terms in Google Cloud.

Cisco ACI	Google Cloud
Tenant	Project
Virtual Routing and Forwarding (VRF)	VPC (virtual private cloud)
BD subnet	Subnet
Contract, filter	Firewall rules
EP-to-EPG mapping	Routing and firewall rules
Endpoint	Network adapter on VM instances

Cisco Cloud Network Controller Licensing

This section lists the licensing requirements to use Cisco Cloud Application Policy Infrastructure Controller (Cisco Cloud Network Controller).

Cisco Cloud Network Controller

Cisco licenses Cisco Cloud Network Controller by each virtual machine (VM) instance that it manages. The Cisco Cloud Network Controller binary images are available on the Google Cloud portal and support the Bring Your Own License (BYOL) model.

The Essential Cloud tier includes licenses for a single policy domain or a single instance of Cisco Cloud Network Controller on a public cloud. If you deploy multiple instances of Cisco Cloud Network Controller, buy an Advantage Cloud license for each VM instance that Cisco Cloud Network Controller manages.

For licensing details, see the *Cisco Application Centric Infrastructure Ordering Guide*.

In addition to obtaining one or more Cisco Cloud Network Controller licenses, you must register your Cisco Cloud Network Controller with Cisco Smart Software Licensing.

Cisco Smart Licensing is a unified license management system that manages software licenses across Cisco products. To learn more about Smart Software Licensing, visit https://www.cisco.com/go/smartlicensing.

Complete the following steps to register Cisco Cloud Network Controller:

1. Ensure that this product has access to the internet or a Smart Software Manager satellite that is installed on your network.
2. Log in to Smart Account:
   a. Smart Software Manager: https://software.cisco.com/
   b. Smart Software Manager Satellite: https://www.cisco.com/c/en/us/buy/smart-accounts/software-manager-satellite.html
3. Navigate to the Virtual Account containing the licenses to be used by this Product Instance.
4. Generate a Product Instance Registration Token (this identifies your Smart Account) and copy or save it.

Cisco Catalyst 8000V

The Cisco Catalyst 8000V supports subscription-based licensing.

- For instructions on subscribing to one of the tier-based Cisco Catalyst 8000V licenses, see Cisco Catalyst 8000V Edge Software.
- For more information on different throughputs based on the tiers, see Resources Used for Cisco Cloud Network Controller Deployment in Google Cloud, on page 5.

Cisco Cloud Network Controller makes use of the "Cisco DNA Advantage" subscription. For features supported by the "Cisco DNA Advantage" subscription, see Cisco DNA Software SD-WAN and Routing Matrices.

Cisco Cloud Network Controller-Related Documentation

You can find information about Cisco Cloud Network Controller and Google Cloud from different resources.

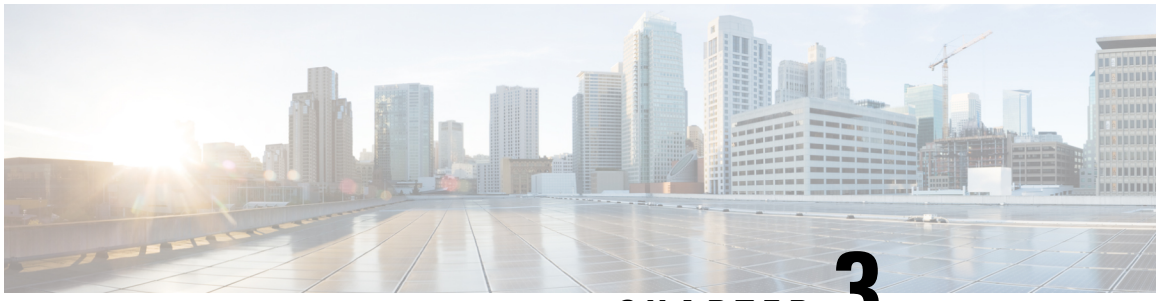
Cisco Cloud Network Controller Documentation

You can find documentation for Cisco Cloud Network Controller Cisco.com:

Cisco Cloud Network Controller documentation library

Google Cloud Documentation

You can find documentation, including user guides, FAQs, case studies, and white papers, on the Google Cloud website.



CHAPTER 3

Preparing for Installing Cisco Cloud Network Controller

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- Cisco Cloud Network Controller Communication Ports, on page 6
- Cisco Cloud Network Controller Installation Workflow, on page 7

Resources Used for Cisco Cloud Network Controller Deployment in Google Cloud

This section lists the requirements for Cisco Cloud Network Controller deployment in Google Cloud.

Cisco Cloud Network Controller Resources

When you deploy Cisco Cloud Network Controller in Google Cloud, the Cisco Cloud Network Controller will use the following instance profile and will create the necessary resources:

- One compute instance:
  - Instance type: n2-standard-16
  - CPU: 16 vCPU
  - Memory: 64 GB
  - Disks: OS disk [300GB] , Data Disk – 100GB [empty]
- Data Disk:
  - Empty data disk
  - Size: 100GB
  - Type: Standard SSD
- VPC network: With autoCreateSubnetworks set to False
- Subnet: Cisco Cloud Network Controller management NIC is attached to this subnet.
- Google Cloud projects: A minimum of two Google Cloud projects:

- One for ACI infra
- One per tenant

Note You can run only one Cloud Network Controller in the infra account. Running multiple Cloud Network Controllers in the same infra account is not supported.

Cisco Catalyst 8000V

Deploy the Cisco Catalyst 8000Vs in the appropriate size, depending on the bandwidth requirement defined during the Cisco Cloud Network Controller setup.

The value for the throughput of the routers determines the size of the Cisco Catalyst 8000V instance that you deploy; a higher value for the throughput results in the deployment of a Google Cloud instance type. Cisco Catalyst 8000V licensing is based on the throughput configuration that you set as part of the Cisco Cloud Network Controller setup process. You need the equivalent or higher license in your Smart account and the AX feature set for compliance.

The Cisco Catalyst 8000V supports tier-based (T0/T1/T2/T3) throughput options. The following table lists what Google Cloud instance types are needed for different router throughput settings for the Cisco Catalyst 8000V:

Cisco Catalyst 8000V Throughput	Google Cloud Instance Type
T0 (up to 15M throughput)	n1-standard-2
T1 (up to 100M throughput)	n1-standard-4
T2 (up to 1G throughput)	n1-standard-4
T3 (up to 10G throughput)	n1-standard-8

Tier2 (T2) is the default throughput supported by Cisco Cloud Network Controller.

Cisco Cloud Network Controller Communication Ports

When configuring your Cisco Cloud Network Controller environment, keep in mind that the following ports are required for network communications:

- For the Cisco Cloud Network Controller, use the same Cisco Cloud Network Controller management IP address that you will use to log into the Cisco Cloud Network Controller at the beginning of Configuring Cisco Cloud Network Controller Using the Setup Wizard, on page 25.
- For the Google Cloud firewall rules:
  - WEB-Server: Ingress allow 80, 443
  - SSH-Allow: Ingress allow 22
- For license registration (towards `tools.cisco.com`): Port 443 (outbound) is required

- For DNS: UDP Port 53 outbound
- For NTP: UDP Port 123 outbound
- If remote authentication is used (LDAP, Radius, TACACS+, SAML), open the proper ports
- If a certificate authority is used, open the proper ports

Cisco Cloud Network Controller Installation Workflow

This section provides a high-level description of the tasks that are required to install and deploy Cisco Cloud Network Controller. You perform installation tasks through Google Cloud management portal and the Cisco Cloud Network Controller First Time Setup Wizard.

1. Fulfill all prerequisites to prepare for support of Google Cloud with Cisco Cloud Network Controller.

   See Preparing for Installing Cisco Cloud Network Controller, on page 5.

2. Deploy Cisco Cloud Network Controller in Google Cloud.

   See Deploying the Cisco Cloud Network Controller in Google Cloud, on page 9.

3. Configure Cisco Cloud Network Controller using the First Time Setup Wizard.

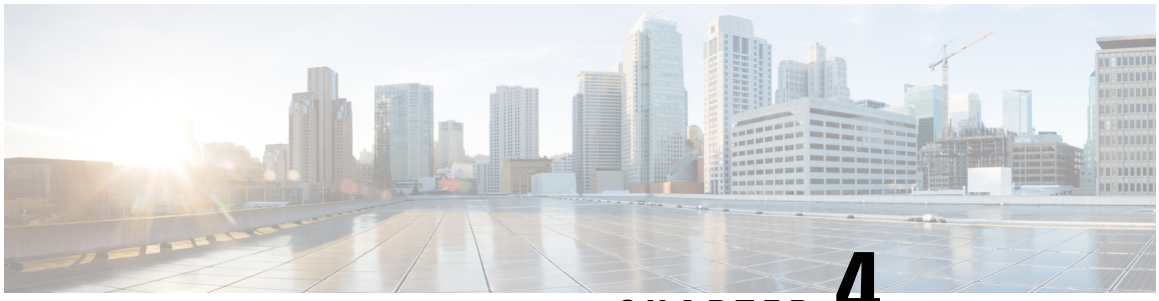
   See Configuring Cisco Cloud Network Controller Using the Setup Wizard, on page 25.

4. Make the necessary configurations through Cisco Cloud Network Controller.

   See Navigating the Cisco Cloud Network Controller GUI, on page 47 and Configuring Cisco Cloud Network Controller Components, on page 48.

5. Delete the deployment, if necessary.

   See Deleting a Cisco Cloud Network Controller Deployment in Google Cloud (External Connectivity Using Google Cloud Routers), on page 19.



CHAPTER 4

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- Generating an SSH Key Pair in Linux or MacOS, on page 12
- Deploying the Cisco Cloud Network Controller in Google Cloud, on page 13
- Deleting a Cisco Cloud Network Controller Deployment in Google Cloud, on page 18

Creating a Project in Google Cloud for the Infra Tenant

This procedure describes how to create a project in Google Cloud, enable the appropriate APIs and services on the project, and assign appropriate permissions to the service account.

The tenant that will be created in these procedures will be referred to as the infra tenant.

Step 1 Log into your Google Cloud account.

Step 2 Create or use an existing project that will be used for Cisco Cloud Network Controller.

See Creating and managing projects in the Google Cloud documentation for those instructions.

If you are using an existing project, verify that there is no previous Cisco Cloud Network Controller deployment on this project. If there is a previous Cisco Cloud Network Controller deployment on this project, delete that existing deployment using the instructions in Deleting a Cisco Cloud Network Controller Deployment in Google Cloud (External Connectivity Using Google Cloud Routers), on page 19.

Step 3 Enable the appropriate APIs and services on your project.

a) In the Google Cloud GUI, navigate to the project that you created for Cisco Cloud Network Controller.
The **Dashboard** for your 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 Logging API
- Cloud Pub/Sub API
- Cloud Resource Manager API
- Cloud Runtime Configuration API
- Identity and Access Management (IAM) API
- Service Usage 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:

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

If they are not enabled automatically, enable them manually.

Step 4 Assign the appropriate permissions to the service account.

There are two types of service accounts:

- **Service account for the project**: This service account allows for the deployment of the Cisco Cloud Network Controller.
- **Service account for the user**: This service account communicates with the APIs. Instead of having a user login or password, this service account acts on behalf of the project and will create resources.

For this step, you will be assigning the appropriate permissions to the service account for the project.

a) In the Google Cloud GUI, navigate back to the **Dashboard** window for your Cisco Cloud Network Controller project.
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 for the deployment.

Locate the service account with the entry `Google APIs Service Agent` shown in the **Name** column (also listed with *<project_number>*`@cloudservices.gserviceaccount.com` in the **Principal** column).

This service account should have been created automatically when you enabled the APIs in the previous step. If this service account was not created automatically, follow these steps to create it manually:

1. Verify that the **PRINCIPALS** tab is selected in the **IAM** window.
2. Click **ADD** at the top part of the window.
3. In the **New Principals** field, enter the name for this service account:

   `<project_number>@cloudservices.gserviceaccount.com`
4. Click **SAVE**.

d) Add the necessary role entries for this service account.

You should see the following entry in the **Role** column for this service account:

- `Editor`

You will also have to add these additional roles for this service account:

- `Project IAM Admin`
- `Role Administrator`

To add the additional role entries for this service account:

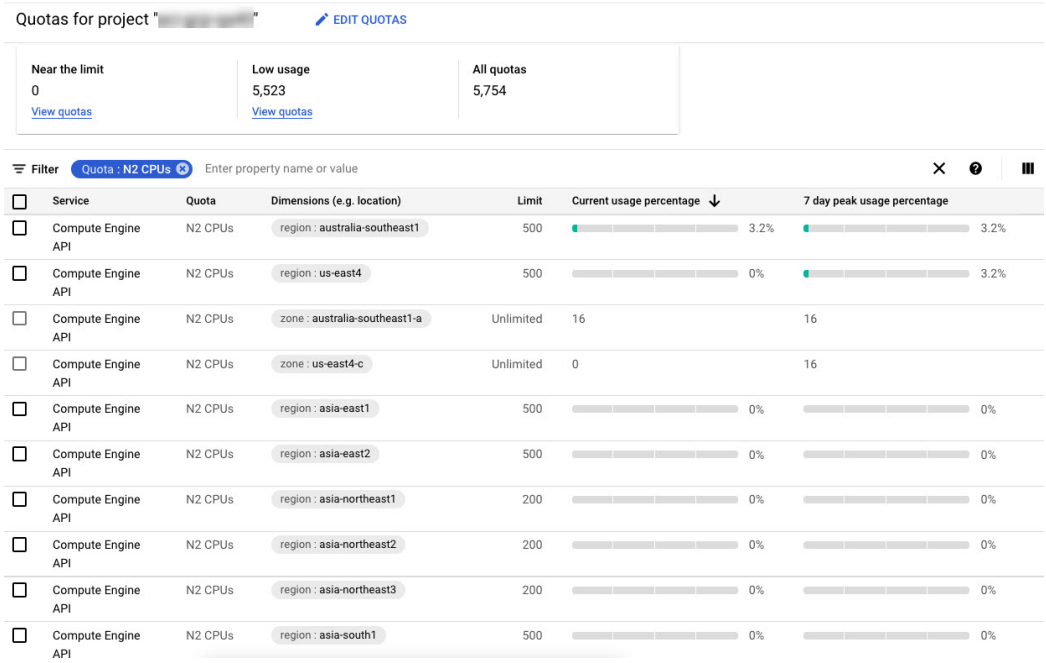
1. Click the pencil icon on the row for this service account.

   The **Edit Permissions** window is displayed.
2. Click **+ ADD ANOTHER ROLE**, then search for and choose the `Project IAM Admin` role entry.
3. Click **+ ADD ANOTHER ROLE** again, then search for and choose the `Role Administrator` role entry.
4. Click **SAVE**.

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

Step 5 Verify that the Google Cloud account has N2 CPUs quota set to at least 16 in the region where the Cisco Cloud Network Controller is deployed, and that the quotas are currently not used.

If this is not the case, raise a case with Google Cloud to increase the quota limit.



Generating an SSH Key Pair in Linux or MacOS

These procedures describe how to generate an SSH public and private key pair in Linux or MacOS.

Step 1 On your Linux virtual machine or Mac, create a public and private key pair using `ssh-keygen`, directing the output to a file.

```
# ssh-keygen -t rsa -f ~/.ssh/cnc-ssh-key -C admin
```

Step 2 Locate the public key file that you saved.

The public key file is saved in this file:

```
~/.ssh/cnc-ssh-key.pub
```

Step 3 Open the public key file and copy the public key information from that file.

The public key information will be in this format:

```
ssh-rsa <public-key-string> admin
```

Verify that you've copied all of the necessary public key information, including the `ssh-rsa` text at the beginning and the `admin` text at the end.

Following is an example of the public key information that you would copy from the file:

```
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABABABgQC+0Aom7Mblv+w7yWE7QOPytvpankAdOsNWd7keptT6nAnr
S2UjHP0c0KC0jABEo7fL0hwQpwKmLRfHi0poQ3FAy7Oof6XcFJx5aCcCayrGDhm96HPbcPoXjhhg0Fufr4QyL9cWpbsKn9K1k
OhnIw+KQyaxCQS1D1wMsgREKMDrkdk5MZazqZC8haThaaAO/h+i+OQ9juo6N6QPUogHRZ+E9ztyGU/buU1/0vnvzTTinvw8aq
mTnPUQxNI6wZ2FpMH8JHiDQ924wIboAEq0tvidnElemG5wsQrwUghD7r1D9uWjI1rsfGAJL8mSIkWbXZFo+AqNlbE69Oa1TIL
```

```
2DfmgYQm3M+qWdzaZPI6i+Ap/dMgGKyy8M4VGFN0o+wbkzi1XdEbMpSEBxyuDtoB5H9T4Kov2yuH/RdqPMSSt+ZgNgBZgcl6S
HXlpSA0GmwyHljYNizo70UMI2JDJDmUc4vCNMgVRxWkNraCWYEZD5iMjnAtIiZvQGmZKQwBH0GY3XIc= admin
```

What to do next

Follow the instructions in Deploying the Cisco Cloud Network Controller in Google Cloud, on page 13 to continue the Google Cloud configuration process, which includes pasting the public key information into the Google Cloud deployment template.

Deploying the Cisco Cloud Network Controller in Google Cloud

Step 1 Log into your Google Cloud account for the Cisco Cloud Network Controller infra tenant.

Step 2 Navigate to the Google Cloud Marketplace.

Step 3 In the search bar, search for:

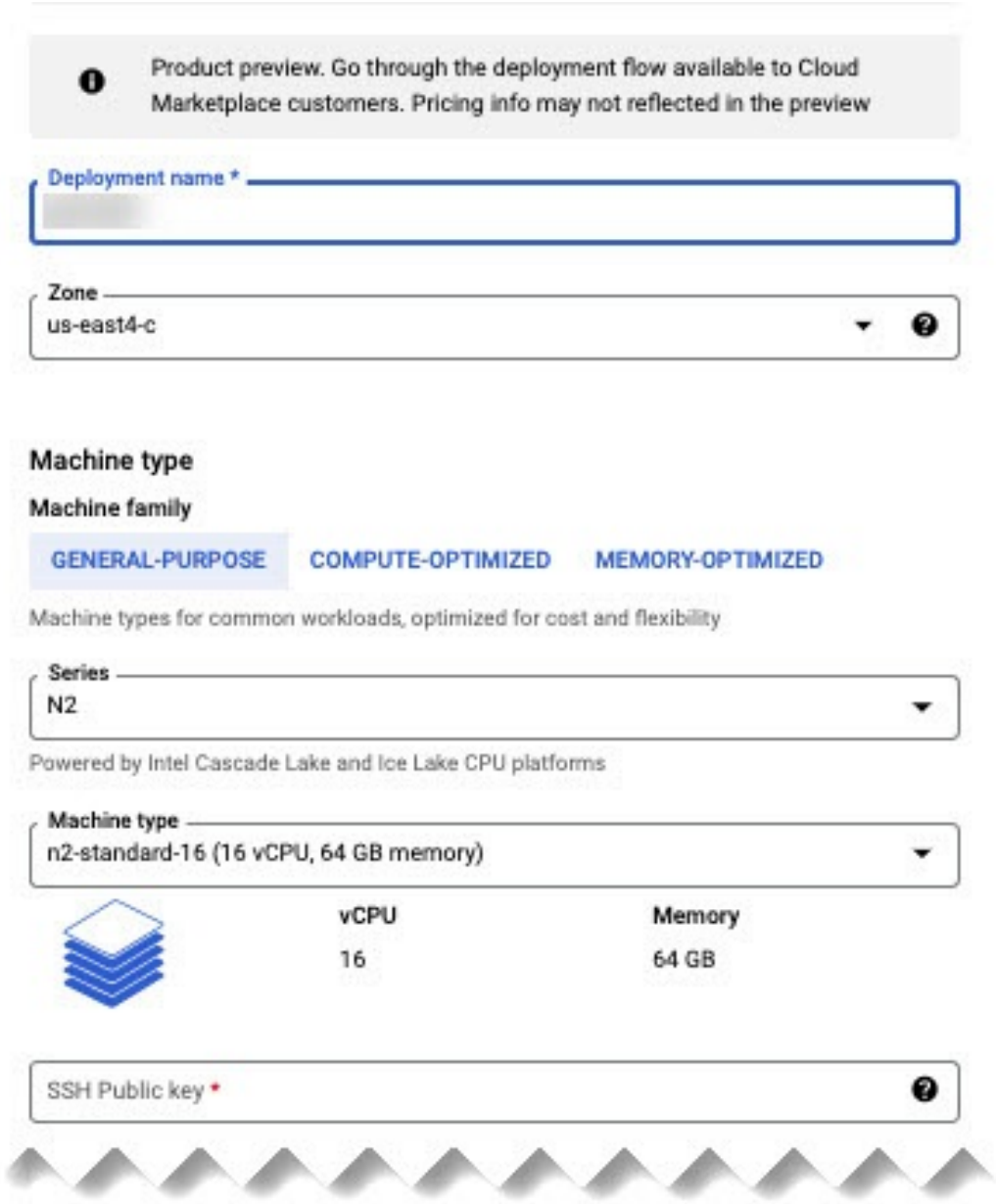
```
Cisco Cloud Network Controller
```

and select the result from that search.

Step 4 In the **Cisco Cloud Network Controller** window in the Google Cloud Marketplace, click **LAUNCH**.

The **New Cisco Cloud Network Controller deployment** window appears.

Deploying the Cisco Cloud Network Controller in Google Cloud



Step 5 In the **New Cisco Cloud Network Controller deployment** window, enter the necessary information in the following fields:

- **Deployment name**: Enter a unique name for this Cisco Cloud Network Controller deployment.
- **Zone**: Select the zone where the Cisco Cloud Network Controller will be deployed.

  The Cisco Cloud Network Controller deployment will be supported in all zones that support the following:

  - **GENERAL PURPOSE** as the **Machine family**
  - **n2-standard-16** as the **Machine type**

  For more information, see:

https://cloud.google.com/compute/docs/general-purpose-machines#n2_machines

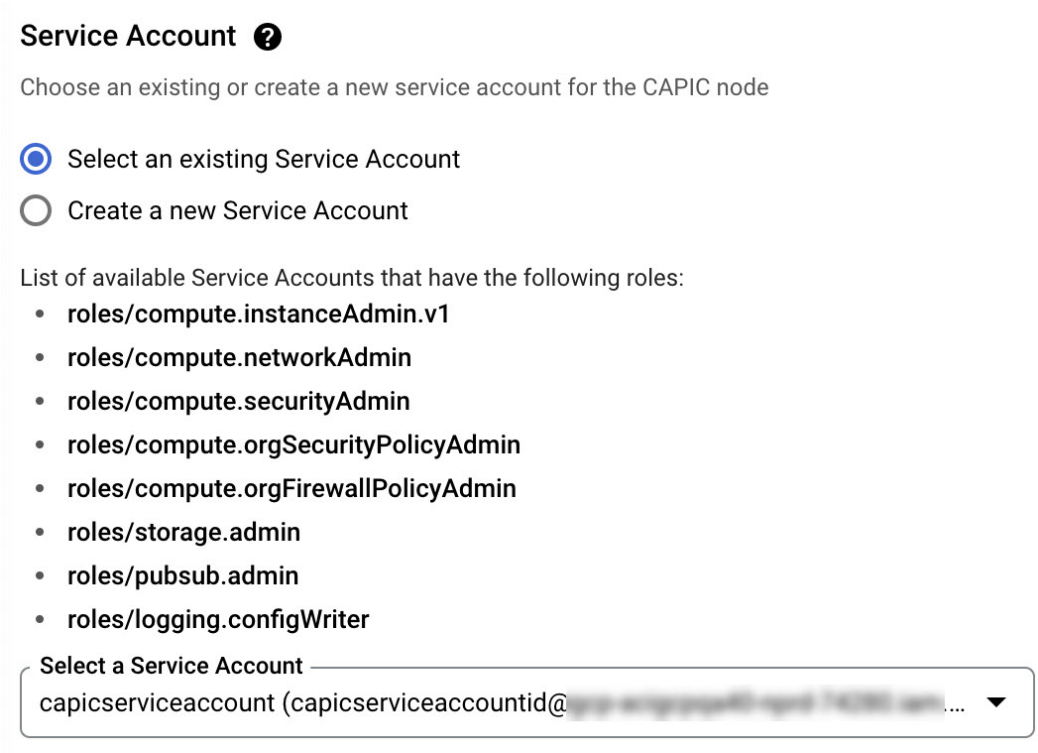
- **Machine type** section:
  - **Machine family**: Select the **GENERAL PURPOSE** tab if it is not already selected.
  - **Series**: Leave the default **N2** selection as-is.
  - **Machine type**: We recommend choosing the **n2-standard-16** option in this field.
  - **SSH Public key**: Enter the SSH public key to enable SSH access to the Cisco Cloud Network Controller. You will use this SSH key pair to log into the Cisco Cloud Network Controller.

    Paste the public key information that you copied at the end of Generating an SSH Key Pair in Linux or MacOS, on page 12. Note that the **ssh-rsa** string should remain at the beginning of the public key string that you paste into this field. This SSH public key must be in the following format:

    ```
    ssh-rsa <ssh-public-key-string> <user-info>
    ```

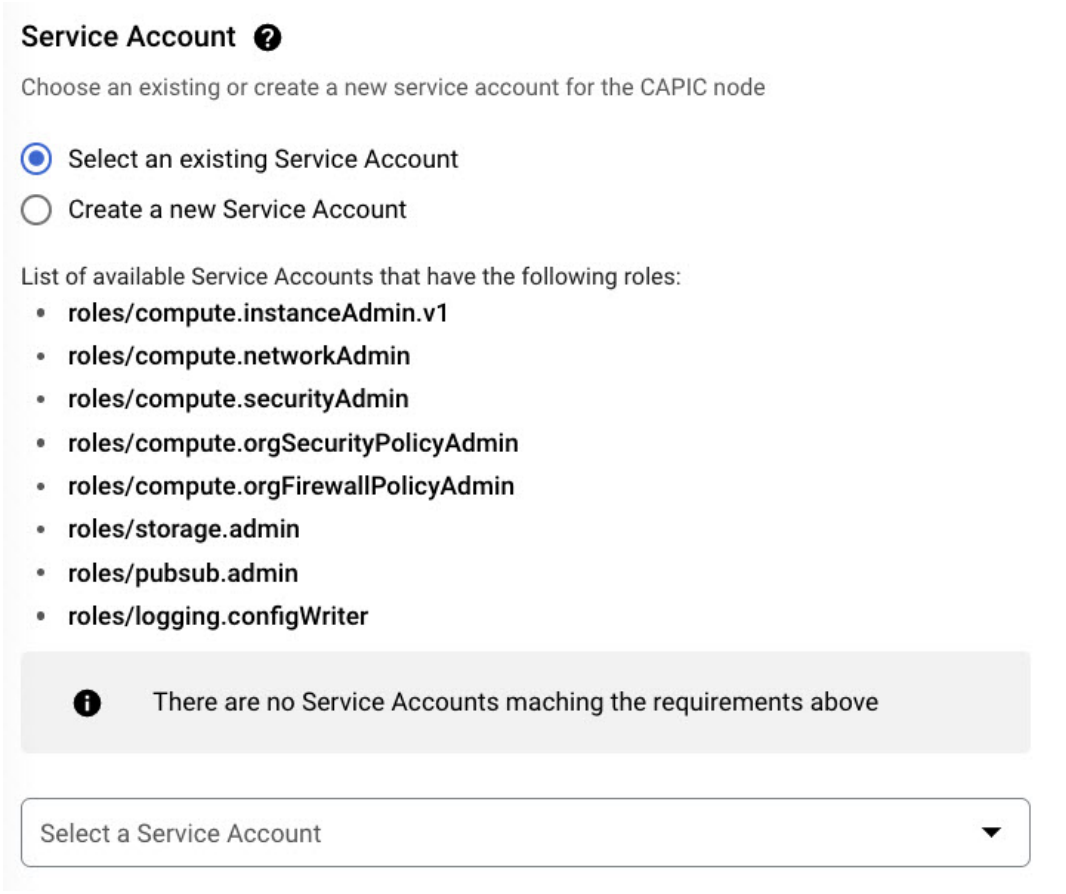
  - **Service Account**: Choose an existing service account or create a new service account for the Cisco Cloud Network Controller deployment.
    - **Select an existing Service Account**: If you have an existing service account that you can use for the Cisco Cloud Network Controller deployment, we recommend that you use that existing service account.

      Click the **Select an existing Service Account** option.
      - If you have an existing service account that you can use for this Cisco Cloud Network Controller deployment, you will see a screen similar to the following:



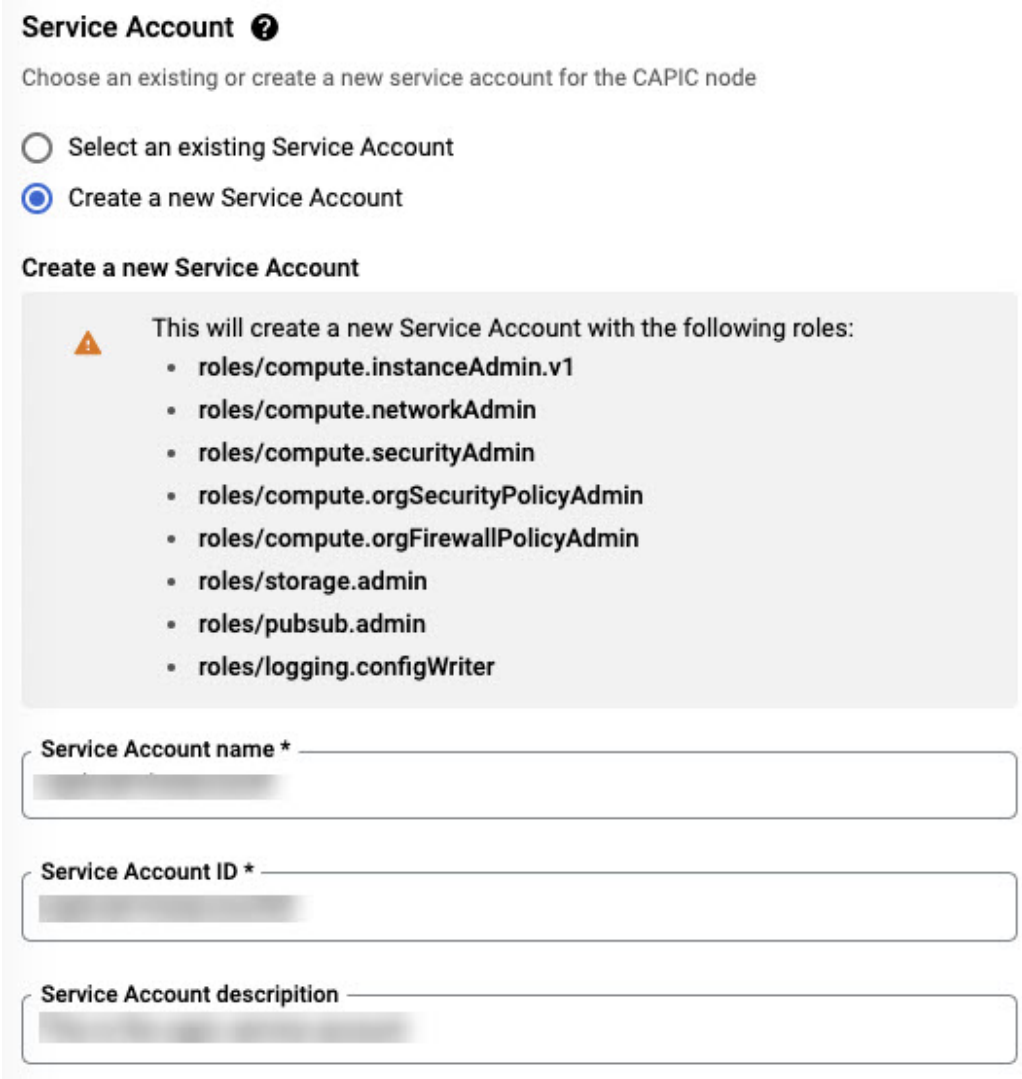
      Select the service account in the **Select a Service Account** field in this case.

- If you do not have an existing service account that you can use for this Cisco Cloud Network Controller deployment, you will see a screen similar to the following:



  If you see this message, then you must create a new service account for this Cisco Cloud Network Controller deployment. Go to the **Create a new Service Account** option below for those instructions.

- **Create a new Service Account**: If you do not have an existing service account that you can use for the Cisco Cloud Network Controller deployment, click the **Create a new Service Account** option.



Enter the following information to create a new service account:

- **Service Account name**: Enter a unique name for this service account. The service account name must be between 1 and 100 characters.
- **Service Account ID**: Enter a unique ID for this service account. The service account ID must be between 6 and 30 characters, and must follow the following pattern:

  [a-z][a-z0-9]+[a-z0-9]

- **Service Account description**: Enter a description for this service account.

- **VPC subnet cidr**: Enter the subnet CIDR to create the subnet and launch the Cisco Cloud Network Controller from this subnet.

  This must be a valid CIDR in the form `x.x.x.x/24`. The subnet mask must be at least /24.

- **Admin user password**: Enter the password of the Cisco Cloud Network Controller admin user.

The password should follow these rules:

- Contain eight or more characters
- At least one letter
- At least one number
- At least one special character

- **Remote Access**: Enter the external network allowed to access the Cisco Cloud Network Controller.

  This must be a valid IP CIDR in the form `x.x.x.x/xx`.

Step 6 Click the box at the bottom of the page to accept the Google Cloud terms, then click **DEPLOY**.

The **Deployment Manager** window appears. A messages saying that the Cisco Cloud Network Controller is being deployed will appear for roughly 5-10 minutes.

- Wait for the message saying that the Cisco Cloud Network Controller has been deployed before proceeding.
- Once you see that message, wait for roughly 10 additional minutes for the system to come to the operational state. You will not be able to log into the Cisco Cloud Network Controller using the password until the system comes to the operational state.

Note If you want to delete a Cisco Cloud Network Controller deployment in Google Cloud for any reason, see Deleting a Cisco Cloud Network Controller Deployment in Google Cloud, on page 18 for those procedures.

What to do next

This infra service account that you created with these procedures will be used for each of the user-tenant projects (managed tenants) to establish communication between the infra and user-tenant projects. Next, go to Configuring Cisco Cloud Network Controller Using the Setup Wizard, on page 25 to set up the cloud infrastructure configuration for your Cisco Cloud Network Controller, where the Cisco Cloud Network Controller deploys the required Google Cloud constructs.

Deleting a Cisco Cloud Network Controller Deployment in Google Cloud

If you want to delete a Cisco Cloud Network Controller deployment in Google Cloud for any reason, the procedures that you will use to delete that deployment will vary, depending on the release that you are running and the type of deployment that you have:

- If you are running on a release prior to release 25.0(5) and you have external connectivity set up using the Google Cloud routers, then follow the instructions in Deleting a Cisco Cloud Network Controller Deployment in Google Cloud (External Connectivity Using Google Cloud Routers), on page 19 if you want to delete that deployment for any reason.
- If you are running on release 25.0(5) or later, and:

- You have external connectivity set up using the Google Cloud routers, then follow the instructions in Deleting a Cisco Cloud Network Controller Deployment in Google Cloud (External Connectivity Using Google Cloud Routers), on page 19 if you want to delete that deployment for any reason.
- You have inter-site connectivity set up using the Cisco Catalyst 8000Vs, then follow the instructions in Deleting a Cisco Cloud Network Controller Deployment in Google Cloud (Inter-Site Connectivity Using Cisco Catalyst 8000Vs), on page 20 if you want to delete that deployment for any reason.

Deleting a Cisco Cloud Network Controller Deployment in Google Cloud (External Connectivity Using Google Cloud Routers)

These procedures assume that you have already deployed the Cisco Cloud Network Controller in Google Cloud using the procedures provided in Deploying the Cisco Cloud Network Controller in Google Cloud, on page 13, where you configured external connectivity using Google Cloud routers but now you want to delete that Cisco Cloud Network Controller deployment in Google Cloud.

If you want to delete a Cisco Cloud Network Controller deployment for any reason, you will need to delete all the resources that you created earlier before you can delete the deployment. Follow these procedures to delete this type of Cisco Cloud Network Controller deployment:

Step 1 If you have an external network deployed in Google Cloud for Cisco Cloud Network Controller, delete the configured external network.

Skip to Step 2, on page 19 if you do not have an external network deployed in Google Cloud for Cisco Cloud Network Controller.

a) In the left navigation bar in the Cisco Cloud Network Controller GUI, navigate to **Application Management** > **External Networks**.
b) In the **External Networks** window, click the box next to the configured external network, then choose **Actions** > **Delete External Network**.

   Click **OK** in the confirmation window to delete the external network.

Step 2 If you have cloud routers deployed in any region, disable external connectivity first.

a) In the Cisco Cloud Network Controller GUI, click the Intent icon ( ).
b) In the **Workflows** area, click **Cisco Cloud Network Controller Setup**.
c) In the **Region Management** area, click **Edit Configuration**.

   The **Region Management** page appears.

d) In the **Region Management** page, locate the regions that have the checks in the boxes under the **External Connectivity using Google Cloud Routers**.

   Having a check in the box in the **External Connectivity using Google Cloud Routers** for a region is an indication that external connectivity is currently enabled for that region.

e) Click the box in the **External Connectivity using Google Cloud Routers** column to remove the check in the checkbox for each region that you want to disable external network connectivity.

   A confirmation window with the following message appears:

```
External Connectivity
Disabling External Connectivity will delete all Hub Networks and IPsec Tunnels, any Route
Leaks for External Networks will be disrupted.
```

f) Click **Confirm** in the confirmation window to disable external connectivity.
g) Click **Save and Continue**, then click **Done**.
h) In the Google Cloud portal, verify that the previously configured VPN connection was successfully deleted by clicking **Hybrid Connectivity** > **VPN**.

You should not see the previously configured VPN connection for your Cisco Cloud Network Controller in this window.

Step 3 Delete the firewall rules in Google Cloud.

a) In the Google Cloud portal, click **VPC network** > **Firewall**.
b) Click the box next to **Name** to select all of the firewall rules displayed in this window.
c) Click **DELETE**.

Click **DELETE** again in the confirmation window to delete these firewall rules.

Step 4 Delete the deployments in Google Cloud.

a) In the Google Cloud portal, navigate to the **Cloud Deployment Manager** page.
b) Click **GO TO CLOUD DEPLOYMENT MANAGER**.

Your Google Cloud deployments are displayed.

c) Click the box next to the deployment that you want to delete, then click **DELETE**.

In the confirmation window, leave the default setting as-is, where you will delete the deployment and all resources created by the deployment. Click **DELETE ALL** in the confirmation window to delete the deployment.

If the deletion fails, a message is displayed, describing which resource still exists that caused the deletion to fail. Locate and delete that resource in that case, then repeat the steps to delete the deployment.

Step 5 Verify that the current deployment is deleted completely before attempting to redeploy.

After you have deleted the current deployment, wait for roughly 10 minutes before redeploying the Cisco Cloud Network Controller.

Deleting a Cisco Cloud Network Controller Deployment in Google Cloud (Inter-Site Connectivity Using Cisco Catalyst 8000Vs)

These procedures assume that you have already deployed the Cisco Cloud Network Controller in Google Cloud using the procedures provided in Deploying the Cisco Cloud Network Controller in Google Cloud, on page 13, where you configured inter-site connectivity using Cisco Catalyst 8000Vs but now you want to delete that Cisco Cloud Network Controller deployment in Google Cloud.

If you want to delete a Cisco Cloud Network Controller deployment for any reason, you will need to delete all the resources that you created earlier before you can delete the deployment. Follow these procedures to delete this type of Cisco Cloud Network Controller deployment:

Step 1 Delete the VM instances in Google Cloud.

a) In the Google Cloud portal, navigate to **Virtual machines** > **VM instances**.

b) Click the box next to **Status** to select all of the VM instances displayed in this window (the instance for the Cisco Cloud Network Controller and the instances for the Cisco Catalyst 8000Vs).

c) Click **DELETE**.

Note You might have to click the vertical ellipsis (…) to see the **DELETE** option.

Click **DELETE** again in the confirmation window to delete these VM instances.

Step 2 Delete the subnets in Google Cloud.

a) In the Google Cloud portal, navigate to **VPC network** > **VPC networks**.

The two VPC networks are shown for the Cisco Cloud Network Controller (the overlay-1 and overlay-1-secondary VPC networks).

b) Click the overlay-1 VPC network, then click the **SUBNETS** tab.

c) Click the box next to **Name** to select all of the subnets displayed in this tab, then click the trashcan icon on the same line as each subnet to delete each subnet.

d) Navigate back to **VPC networks** again, click the overlay-1-secondary VPC network, then click the **SUBNETS** tab in that VPC network.

e) Click the box next to **Name** to select all of the subnets displayed in this tab, then click the trashcan icon on the same line as each subnet to delete each subnet.

f) Navigate back to **VPC networks** again and verify that the subnets are no longer showing for each VPC network.

You might have to wait several seconds and click **REFRESH** to see that the subnets have been deleted.

Step 3 If you have native cloud routers deployed in any region, disable external connectivity to delete the VPN tunnels, VPN gateways, and native cloud routers.

a) In the Cisco Cloud Network Controller GUI, click the Intent icon ( ).

b) In the **Workflows** area, click **Cisco Cloud Network Controller Setup**.

c) In the **Region Management** area, click **Edit Configuration**.

The **Region Management** page appears.

d) In the **Region Management** page, locate the regions that have the checks in the boxes under the **External Connectivity using Google Cloud Routers**.

Having a check in the box in the **External Connectivity using Google Cloud Routers** for a region is an indication that external connectivity is currently enabled for that region.

e) Click the box in the **External Connectivity using Google Cloud Routers** column to remove the check in the checkbox for each region that you want to disable external network connectivity.

A confirmation window with the following message appears:

```
External Connectivity
Disabling External Connectivity will delete all Hub Networks and IPsec Tunnels, any Route
Leaks for External Networks will be disrupted.
```

f) Click **Confirm** in the confirmation window to disable external connectivity.

g) Click **Save and Continue**, then click **Done**.

h) In the Google Cloud portal, verify that the previously configured VPN connection was successfully deleted by clicking **Hybrid Connectivity** > **VPN**.

You should not see the previously configured VPN connection for your Cisco Cloud Network Controller in this window.

Step 4 Delete the firewall rules in Google Cloud.

a) In the Google Cloud portal, navigate to **VPC network** > **Firewall**.
b) Click the box next to **Name** to select all of the firewall rules displayed in this window.
c) Click **DELETE**.

Click **DELETE** again in the confirmation window to delete these firewall rules.

Step 5 Delete the VPC peerings in Google Cloud.

a) In the Google Cloud portal, navigate to **VPC network** > **VPC network peering**.
b) Click the box next to **Name** to select all of the VPC network peerings displayed in this window.
c) Click **DELETE**.

Click **DELETE** again in the confirmation window to delete these VPC network peerings.

Step 6 Delete the VPCs in Google Cloud.

a) In the Google Cloud portal, navigate to **VPC network** > **VPC networks**.

The two VPC networks are shown for the Cisco Cloud Network Controller (the overlay-1 and overlay-1-secondary VPC networks).

b) Click the overlay-1 VPC network.
c) Click **DELETE VPC NETWORK** to delete this VPC network.

Click **DELETE** again in the confirmation window to delete this VPC network.

d) Navigate back to **VPC networks** again and click the overlay-1-secondary VPC network.
e) Click **DELETE VPC NETWORK** to delete this VPC network.

Click **DELETE** again in the confirmation window to delete this VPC network.

Step 7 If you have an external network deployed in Google Cloud for Cisco Cloud Network Controller, delete the configured external network.

a) In the left navigation bar in the Cisco Cloud Network Controller GUI, navigate to **Application Management** > **External Networks**.
b) In the **External Networks** window, click the box next to the configured external network, then choose **Actions** > **Delete External Network**.

Click **OK** in the confirmation window to delete the external network.

Step 8 Delete the deployments in Google Cloud.

a) In the Google Cloud portal, navigate to the **Cloud Deployment Manager** page.
b) Click **GO TO CLOUD DEPLOYMENT MANAGER**.

Your Google Cloud deployments are displayed.

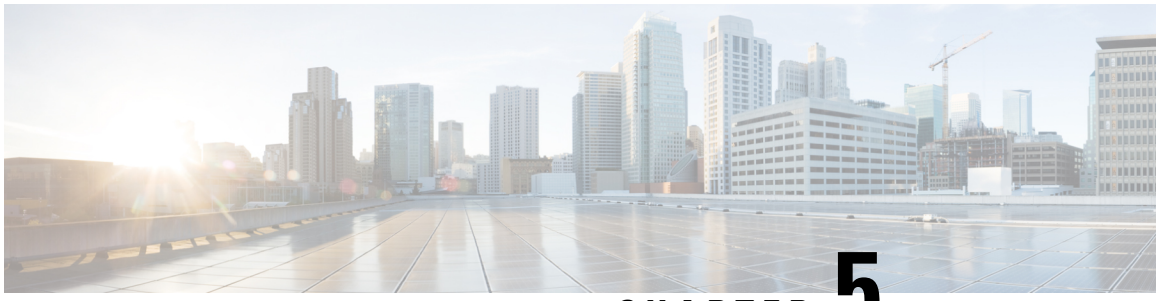
c) Click the box next to the deployment that you want to delete, then click **DELETE**.

In the confirmation window, leave the default setting as-is, where you will delete the deployment and all resources created by the deployment. Click **DELETE ALL** in the confirmation window to delete the deployment.

If the deletion fails, a message is displayed, describing which resource still exists that caused the deletion to fail. Locate and delete that resource in that case, then repeat the steps to delete the deployment.

Step 9 Verify that the current deployment is deleted completely before attempting to redeploy.

After you have deleted the current deployment, wait for roughly 10 minutes before redeploying the Cisco Cloud Network Controller.



CHAPTER 5

Configuring Cisco Cloud Network Controller Using the Setup Wizard

- Configuring Cisco Cloud Network Controller Using the Setup Wizard, on page 25
- Verifying the Cisco Cloud Network Controller Setup Wizard Configurations, on page 32

Configuring Cisco Cloud Network Controller Using the Setup Wizard

Follow the procedures in this topic to set up the cloud infrastructure configuration for your Cisco Cloud Network Controller. Cisco Cloud Network Controller will automatically deploy the required Google Cloud constructs.

Before you begin

Following are the prerequisites for this task:

- You have a minimum of two Google Cloud projects, one for ACI infra and one per tenant.
- You have successfully completed the procedures that are provided in Deploying the Cisco Cloud Network Controller in Google Cloud, on page 9.

Step 1 Locate the IP address for your Cisco Cloud Network Controller.

The management IP address is shown at the end of the output from the Deployment Manager in Deploying the Cisco Cloud Network Controller in Google Cloud, on page 13.

You can also locate the IP address for your Cisco Cloud Network Controller by navigating to **Compute Engine** > **VM instances**. The IP address shown in the **External IP** column is the IP address for your Cisco Cloud Network Controller.

Step 2 Open a browser window and, using the secure version of HTTP (`https://`), paste the IP address into the URL field, then press Return to access this Cisco Cloud Network Controller.

For example, `https://192.168.0.0`.

If you see a message asking you to **Ignore Risk and Accept Certificate**, accept the certificate to continue.

Step 3 Enter the following information in the login page for the Cisco Cloud Network Controller:

- **Username:** Enter **admin** for this field.
- **Password:** Enter the password that you provided to log into the Cisco Cloud Network Controller.
- **Domain:** If you see the **Domain** field, leave the default Domain entry as-is.

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

Note If you see an error message when you try to log in, such as `REST Endpoint user authentication datastore is not initialized - Check Fabric Membership Status of this fabric node`, wait for several minutes, then try again after a few minutes. You might also have to refresh the page in order to log in.

The Welcome to Cisco Cloud Network Controller setup wizard page appears.

Step 5 Click **Begin Set Up**.

The **Let's Configure the Basics** page appears, with these areas to be configured:

- **DNS and NTP Servers**
- **Region Management**
- **Advanced Settings**
- **Smart Licensing**

Step 6 In the **DNS and NTP Servers** row, click **Edit Configuration**.

The **DNS and NTP** page appears.

Step 7 In the **DNS and NTP** page, add the DNS, if necessary, and NTP servers.

- A DNS server is already configured by default. Add a DNS server if you want to use a specific DNS server.
- An NTP server is not configured by default, however, so we recommend that you configure an NTP server. Skip to 7.d, on page 26 if you want to configure an NTP server and you do not want to configure a DNS server.

a) If you want to use a specific DNS server, under the **DNS Servers** area, click **+Add DNS Provider**.
b) Enter the IP address for the DNS servers and, if necessary, check the box next to Preferred DNS Provider.
c) Click the check mark next to the DNS server, and repeat for any additional DNS servers that you want to add.
d) Under the **NTP Servers** area, click **+Add Providers**.
e) Enter the IP address for the NTP servers and, if necessary, check the box next to Preferred NTP Provider.
f) Click the check mark next to the NTP server, and repeat for any additional NTP servers that you want to add.

Step 8 When you have finished adding the DNS and NTP servers, click **Save and Continue**.

The **Let's Configure the Basics** page appears again.

Step 9 In the **Region Management** row, click **Begin**.

The **Region Management** page appears.

Step 10 Verify that all of the regions in the page are selected.

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 (all of the regions are selected and can't be unselected) and inter-region connectivity is present.

Step 11 Determine if you want to configure inter-site connectivity and/or external network connectivity.

- For releases prior to release 25.0(5), click the box next to **Enable** to enable external network connectivity.
- For release 25.0(5) and later, determine if you want to configure inter-site connectivity and/or external network connectivity:
  - **Catalyst 8000Vs**: Click the box in this column for a region if you want to use the Cisco Catalyst 8000V router for inter-site connectivity for inter-site use cases.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" in the *Cisco Cloud Network Controller for Google Cloud User Guide* for more information.
  - **External Connectivity using Google Cloud Routers**: Click the box in this column for any region where you want to use the Google Cloud router for external network connectivity. This allows you to configure an IPv4 connection between a Google Cloud site and non-Google Cloud sites or an external device, where a VPN connection is created between a Google Cloud router and an external device. See "External Network Connectivity" in the *Cisco Cloud Network Controller for Google Cloud User Guide* for more information.

Step 12 Click the appropriate button to advance to the next page.

- If you did not configure inter-site connectivity or external network connectivity in the **Region Management** page (if you didn't select any options in the **Region Management** page), then click **Save and Continue**. You are returned to the **Let's Configure the Basics** page. Go to Step 20, on page 30.
- If you enabled inter-site connectivity and/or external network connectivity, click **Next** at the bottom of the page. The **General Connectivity** page appears.

Step 13 If you configured inter-site connectivity (if you selected the **Catalyst 8000Vs** option for one or more regions in the **Region Management** page), 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 **Region Management** 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 16.c, on page 29)

Step 14 If you configured external network connectivity (if you selected the **External Connectivity using Google Cloud Routers** option for one or more regions in the **Region Management** page), enter the necessary information in the **Hub Network** area, if necessary.

Hub network management is used to deploy cloud routers on specific managed regions.

Note the following restrictions:

- You can create only one hub network in Google Cloud.
- Under the hub network, only one cloud router per region can be created in Google Cloud.
- You can add up to four regions to deploy the hub network. The hub network will create one cloud router in each region selected in the previous **Region Management** page.

In the previous **Region Management** page:

- If you enabled inter-site connectivity (if you clicked the boxes in the **Catalyst 8000Vs** column for certain regions) and you did *not* enable external network connectivity (you did not click any boxes in the **External Connectivity using Google Cloud Routers** column for any regions), then the **Hub Network** area has the following entries by default and cannot be edited:
  - **Name**: default
  - **BGP Autonomous System Number**: 65534
  - **VPN Router**: default
- If you did enable external network connectivity (you did click one or more boxes in the **External Connectivity using Google Cloud Routers** column for any regions), then you can edit the default entry in the **BGP Autonomous System Number** field, if necessary.

a) In the **Hub Network** area, click the pencil icon to edit the information in the**Hub Network** field.

The **Edit Hub Network** window appears. Note that the default entries in the **Name** and **VPN Router** fields cannot be edited.

b) Change the value in the **BGP Autonomous System Number** field, if necessary.

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.

c) Click **Done** when you are finished entering information in the **Editing Hub Network** window.

You are returned to the **General Connectivity** page.

Step 15 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 default 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 16 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.

Configuring Cisco Cloud Network Controller Using the Setup Wizard

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.

c) In the **Number of Routers Per Region** field, choose the number of Catalyst 8000Vs that will be used in each region.

d) In the **Username**, enter the username for the Catalyst 8000V.

e) In the **Password** field, enter the password for the Catalyst 8000V.

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

f) 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, on page 5 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.

g) 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, on page 3 for more information.

Note If you assigned private IP addresses to the Catalyst 8000Vs in 16.b, on page 28, 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 17 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 Configuring an External Network, on page 33 for those procedures.
- If you do not want to create external networks, click **Go to Dashboard**.

  You are returned to the main **Dashboard** window.

Step 18 Click the **Intent** icon.
The **Intent** menu appears.

Step 19 In the **Workflows** area, click **Cisco Cloud Network Controller Setup**.
The **Set up - Overview** dialog box appears with options for **DNS and NTP Servers**, **Advanced Settings**, **Region Management**, and **Smart Licensing**.

Step 20 In the **Advanced Settings** area, click **Edit Configuration**.

Step 21 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, then clicking the **Contract Based Routing** option under the **Inter-Site Connectivity** area.

Step 22 In the **Smart Licensing** row, click **Register**.

The **Smart Licensing** page appears.

Step 23 Enter the necessary information in the **Smart Licensing** page.

Cisco Smart Licensing is a unified license management system that manages software licenses across Cisco products. To register your Cisco Cloud Network Controller with Cisco Smart Software Licensing, do the following

- Ensure that this product has access to the internet or a Smart Software Manager satellite installed on your network.
- Log in to Smart Account:
  - Smart Software Manager: https://software.cisco.com/

- Smart Software Manager Satellite: https://www.cisco.com/c/en/us/buy/smart-accounts/software-manager-satellite.html

- Navigate to the Virtual Account containing the licenses to be used by this Product Instance.
- Generate a Product Instance Registration Token (this identifies your Smart Account) and copy or save it.

To learn more about Smart Software Licensing, visit https://www.cisco.com/go/smartlicensing.

Step 24 Click **Register** at the bottom of the page if you entered the necessary licensing information on this page, or click **Continue in Evaluation Mode** if you want to continue in evaluation mode instead.

The **Summary** page appears.

Step 25 Verify the information on the **Summary** page, then click **Finish**.

At this point, you are finished with the internal network connectivity configuration for your Cisco Cloud Network Controller.

If this is the first time that you are deploying your Cisco Cloud Network Controller, this process might take quite a bit of time, possibly 30 minutes or so before the process is successfully completed.

What to do next

Complete the procedures in any of the following sections or documents, if necessary:

- Verifying the Cisco Cloud Network Controller Setup Wizard Configurations, on page 32
- Completing the Initial Configuration, on page 33
  - Configuring an External Network, on page 33
  - Creating a Tenant, on page 35
  - If you configured a BGP-EVPN connection for inter-site connectivity using Cisco Catalyst 8000V routers, follow the procedures in Configuring VPC Peering for Inter-Site Connectivity Using BGP-EVPN, on page 45 to allow the user VPCs in the Google Cloud site to communicate with VPCs in other cloud sites or an ACI on-premises site.
- If you are managing additional sites (an on-premises site or cloud sites) along with the Cisco Cloud Network Controller site, refer to the Managing Google Cloud Sites Using Nexus Dashboard Orchestrator document.
- Understanding the Cisco Cloud Network Controller GUI, on page 47
- Logging Into Cisco Cloud Network Controller Through SSH, on page 49

Verifying the Cisco Cloud Network Controller Setup Wizard Configurations

Use the procedures in this topic to verify that the configuration information that you entered in the Cisco Cloud Network Controller Setup Wizard are applied correctly.

Step 1 In Cisco Cloud Network Controller, verify the following settings:

- Under **Cloud Resources**, click on **Regions** and verify that the all of the regions are shown as **managed** in the Admin State column.
- Under **Infrastructure**, click on **External Connectivity** and verify the information in this screen is correct.
- Click on **Dashboard** and use the external connectivity status to verify that the setup wizard and tunnel configurations were done properly.

Step 2 If you set up a BGP-EVPN connection for inter-site connectivity using the Catalyst 8000Vs, 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.

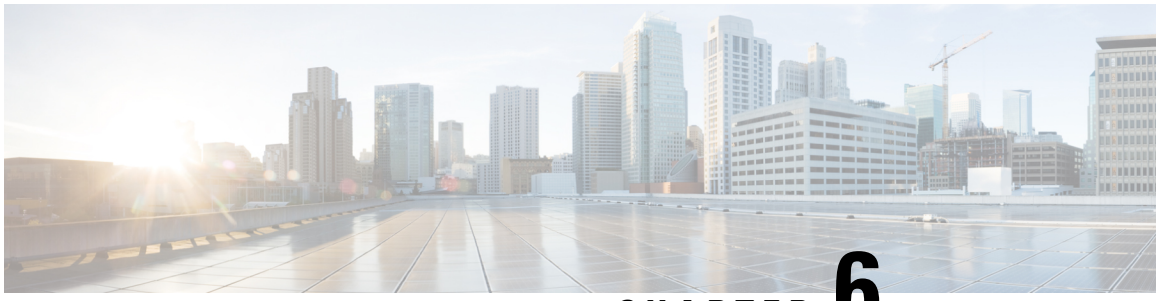
a) Log into the Google Cloud project associated with the infra tenant.
b) Navigate to **Compute Engine** > **VM instances** in Google Cloud.
c) Verify that the number of VM instances shown in the **Instances** tab match the total number of Catalyst 8000Vs that you have for the BGP-EVPN connection for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

   For example, when you were setting up the cloud infrastructure configuration for your Cisco Cloud Network Controller in Configuring Cisco Cloud Network Controller Using the Setup Wizard, on page 25, if you chose two regions and two Catalyst 8000Vs for each region, you should see four VM instances in the **Instances** tab.

Step 3 If you set up a BGP-EVPN connection for inter-site connectivity using the Catalyst 8000Vs, 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" in the *Cisco Cloud Network Controller for Google Cloud User Guide* for more information.

a) Navigate to **VPC network** > **VPC networks** in Google Cloud.
b) 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.



CHAPTER 6

Completing the Initial Configuration

- Configuring an External Network, on page 33
- Creating a Tenant, on page 35
- Configuring VPC Peering for Inter-Site Connectivity Using BGP-EVPN, on page 45

Configuring an External Network

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 Configuring Cisco Cloud Network Controller Using the Setup Wizard, on page 25.

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

Table 2: Create External Network Dialog Box Fields

Properties	Description
General	
Name	Enter the name for the external network.

Properties	Description
VRF	This external VRF will be used for external connectivity with the on-premises CCR. You can create multiple external VRFs for this purpose. This VRF will be identified as an external VRF if the VRF has all three of the following characteristics: • Configured under the `infra` tenant • Associated with an external network • Not associated with a cloud context profile 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 infra tenant, and that external VRF is not allowed to be associated with a cloud context profile or subnet. To choose an external VRF: **a.** Click **Select VRF**. The **Select VRF** dialog box appears. **b.** From the **Select VRF** dialog, click to choose a VRF in the left column. You can also create a VRF using the **+ Create VRF** option. **c.** Click **Select**. You return to the **Create External Network** dialog box.
Hub Network	The hub network is displayed automatically after you configured it in the First Time Setup. **Note** 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 Cisco Cloud Network Controller for Google Cloud Installation Guide, Release 25.0(x) or later.
VPN Router	This field is not editable. The default VPN router is automatically selected.
Settings	
Regions	To choose a region: **a.** Click **Add Regions**. The **Select Regions** dialog box appears. • The regions that you selected as part of the First Time Setup are displayed here. • You can select multiple regions to bring up the cloud router in multiple regions. **b.** From the **Select Regions** dialog, click to choose a region in the left column then click **Select**. You return to the **Create External Network** dialog box.

Properties	Description
VPN Networks	The VPN networks entries are used for internal connectivity. All configured VPN networks will be applied to all the selected regions. To add a VPN network: **a.** Click **Add VPN Network**. The **Add VPN Network** dialog box appears. **b.** In the **Name** field, enter a name for the VPN network. **c.** Click **+ Add IPSec Peer**. Two tunnels are created for each IPSec peer entry. **d.** Enter values for the following fields for the IPSec peer that you want to add: • **Public IP of IPSec Tunnel Peer** • **Pre-Shared Key** • **IKE Version**: Select **ikev1** or **ikev2** for IPSec tunnel connectivity • **BGP Peer ASN** • **Subnet Pool Name**: Click **Select Subnet Pool Name**. The **Select Subnet Pool Name** dialog box appears. Select one of the available subnet pools that are listed, then click **Select**. **e.** Click the checkmark to add this IPSec tunnel. Click **+ Add IPSec Tunnel** if you want to add another IPSec tunnel. **f.** Click **Add** in the **Add VPN Network** dialog box. You return to the **Create External Network** dialog box.

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**.

Creating a Tenant

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

Understanding Google Cloud Deployments with Cisco Cloud Network Controller

Google Cloud organizes resources in a way that resembles a file system, where:

- The *Organization* at the top level can have multiple *Folders*.
- Every *Folder* can contain other *Folders*, or can contain *Projects*, where every *Project* has a unique ID.
- Cloud *resources* (such as VMs, VPCs, and subnets) are contained within a *Project*.

While the Organization and Folder levels are useful areas to understand from the Google Cloud perspective, the Project level is the most relevant from the Cisco Cloud Network Controller perspective.

Each Cisco Cloud Network Controller tenant is mapped one-to-one to a Google Cloud Project, which means that:

- A Cisco Cloud Network Controller tenant cannot span multiple Google Cloud Projects
- There cannot be more than one Cisco Cloud Network Controller tenant in a Google Cloud Project

With Cisco Cloud Network Controller, Google Cloud provides access to Projects using **Service Accounts**. These accounts are meant for applications that need to access Google Cloud services. They can be used to run and deploy Cisco Cloud Network Controller and to push policies for other tenants. Service accounts used in applications running within Google Cloud do not need credentials, whereas applications that are run external to Google Cloud need a pre-generated private key. Service Accounts reside in one Google Cloud Project, but they can also be given access to manage policies for other Projects (for Cisco Cloud Network Controller, other tenants).

The following sections provide more information on different ways that Cisco Cloud Network Controller tenants can be configured with Google Cloud:

- User Tenants With Managed Credentials, on page 36
- User Tenants With Unmanaged Credentials, on page 37

User Tenants With Managed Credentials

This type of user tenant has the following characteristics:

- This tenant account is managed by the Cisco Cloud Network Controller.
- You will first choose **Managed Identity** in the Cisco Cloud Network Controller GUI as part of the tenant configuration process for this type of user tenant.
- After you have configured the necessary parameters in the Cisco Cloud Network Controller, you must then set the necessary roles for this tenant in Google Cloud. Add the service account created by the Cisco Cloud Network Controller as an IAM user with the following rules:
  - Cloud Functions Service Agent
  - Compute Instance Admin (v1)
  - Compute Network Admin
  - Compute Security Admin
  - Logging Admin

- Pub/Sub Admin
- Storage Admin

For instructions on creating this sort of tenant, see Creating a Managed Tenant Using the Cisco Cloud Network Controller GUI, on page 39.

User Tenants With Unmanaged Credentials

This type of user tenant has the following characteristics:

- This tenant account is not managed by the Cisco Cloud Network Controller.
- Before configuring the necessary parameters in the Cisco Cloud Network Controller for this type of tenant, you must first download the JSON file that contains the necessary private key information from Google Cloud for the service account associated with this tenant.
- You will then choose **Unmanaged Identity** in the Cisco Cloud Network Controller GUI as part of the tenant configuration process for this type of user tenant. As part of the configuration process for this type of tenant in Cisco Cloud Network Controller, you will provide the following information from the downloaded JSON file:
  - Key ID
  - RSA Private Key
  - Client ID
  - Email

For instructions on creating this sort of tenant, see Creating an Unmanaged Tenant Using the Cisco Cloud Network Controller GUI, on page 43.

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.

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.

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.

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 37 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 3: Create Tenant Dialog Box Fields

Properties	Description
Name	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.
Description	Enter a description of the tenant.
Settings	
Add Security Domain	To add a security domain for the tenant: **a.** Click **Add Security Domain**. The **Select Security Domains** dialog appears with a list of security domains in the left pane. **b.** Click to choose a security domain. **c.** Click **Select** to add the security domain to the tenant.
Google Cloud Project	
Google Cloud Project ID	Enter the Google Cloud Project ID that will be associated with this Cisco Cloud Network Controller tenant.
Access Type	For a tenant that will be managed by the Cisco Cloud Network Controller, choose **Managed Identity** as the access type. For more information, see Understanding Google Cloud Deployments with Cisco Cloud Network Controller, on page 36.
Add Security Domain for Google Cloud Project	**Note** Adding a security domain for Google Cloud is optional when creating a tenant. To add a security domain for the account: **a.** Click **Add Security Domain for Google Cloud Project**. The **Select Security Domains** dialog appears with a list of security domains in the left pane. **b.** Click to choose a security domain. **c.** Click **Select** to add the security domain to the tenant.

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 41 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 1 In Google Cloud, select the Google Cloud project that will be associated with this unmanaged tenant, if you have not selected it already .

Step 2 In the left nav bar, click on **IAM & Admin**, then choose **Service Accounts**.

The service accounts for this Google Cloud project are displayed.

Step 3 Select an existing service account or click **+ CREATE SERVICE ACCOUNT** to create a new one.

Information on this service account is displayed, with the **Details** tab selected by default.

Step 4 Click the **KEYS** tab.

Step 5 Click **ADD KEY** > **Create New Key**.

A window appears, providing an option to create a private key for this service account.

Step 6 Leave the **JSON** key type selected, then click **Create**.

A window appears, saying that the private key has been saved to your computer.

Step 7 Locate the JSON file that was downloaded to your computer and move it to a secure location on your computer.

This JSON file will contain the key information that you need to fill in the fields for the unmanaged tenant.

Creating an Unmanaged Tenant Using the Cisco Cloud Network Controller GUI

This section explains how to create a tenant that will not be managed by Cisco Cloud Network Controller using the GUI.

Before you begin

Complete the procedures provided in Generating and Downloading Private Key Information from Google Cloud for an Unmanaged Tenant, on page 42 before proceeding with the procedures in this section.

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 37 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 4: Create Tenant Dialog Box Fields

Properties	Description
Name	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.
Description	Enter a description of the tenant.
Settings	

Properties	Description
Add Security Domain	To add a security domain for the tenant: **a.** Click **Add Security Domain**. The **Select Security Domains** dialog appears with a list of security domains in the left pane. **b.** Click to choose a security domain. **c.** Click **Select** to add the security domain to the tenant.
Google Cloud Project	
Google Cloud Project ID	Enter the Google Cloud Project ID that will be associated with this Cisco Cloud Network Controller tenant.
Access Type	For a tenant that will not be managed by the Cisco Cloud Network Controller, choose **Unmanaged Identity** as the access type. For more information, see Understanding Google Cloud Deployments with Cisco Cloud Network Controller, on page 36.
Key ID	Enter the information from the `private_key_id` field in the JSON file that you downloaded in Generating and Downloading Private Key Information from Google Cloud for an Unmanaged Tenant, on page 42.
RSA Private Key	Enter the information from the `private_key` field in the JSON file that you downloaded in Generating and Downloading Private Key Information from Google Cloud for an Unmanaged Tenant, on page 42.
Client ID	Enter the information from the `client_id` field in the JSON file that you downloaded in Generating and Downloading Private Key Information from Google Cloud for an Unmanaged Tenant, on page 42.
Email	Enter the email address associated with your Google Cloud project.
Add Security Domain for Google Cloud Project	**Note** Adding a security domain for Google Cloud is optional when creating a tenant. To add a security domain for the account: **a.** Click **Add Security Domain for Google Cloud Project**. The **Select Security Domains** dialog appears with a list of security domains in the left pane. **b.** Click to choose a security domain. **c.** Click **Select** to add the security domain to the tenant.

Step 5 Click **Save** when finished.

Configuring VPC Peering for Inter-Site Connectivity Using BGP-EVPN

If you configured a BGP-EVPN connection for inter-site connectivity using Cisco Catalyst 8000V routers, follow these procedures to allow the user VPCs in the Google Cloud site to communicate with VPCs in other cloud sites or an ACI on-premises site. See "VPC Peering" in the "Inter-Site Connectivity Using BGP-EVPN" section in the *Cisco Cloud Network Controller for Google Cloud User Guide* for more information.

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:

Step 1 In the Cisco Cloud Network Controller GUI, navigate to **Application Management** > **Cloud Context Profiles**.

Step 2 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.

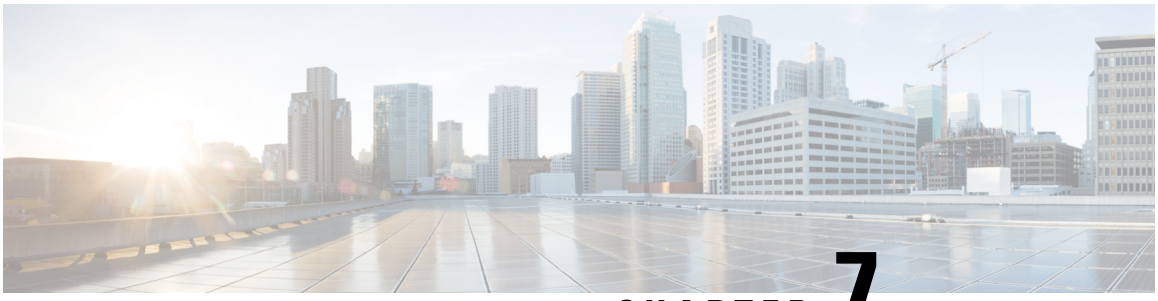
Another window appears that provides more detailed information for this cloud context profile.

Step 3 Click **Actions** > **Edit**.

Step 4 In the **VPC Hub Peering** area, click the box next to **Enable** to enable VPC peering for this VPC, then click **Save**.

Step 5 In the Google Cloud, navigate to **VPC network** > **VPC network peering**.

Step 6 Verify that your user VPC in the Google Cloud site is peering with the overlay-1 VPC.



CHAPTER 7

Understanding the Cisco Cloud Network Controller GUI

- Navigating the Cisco Cloud Network Controller GUI, on page 47
- Creating a Tenant Using the Cisco Cloud Network Controller GUI, on page 48
- Configuring Cisco Cloud Network Controller Components, on page 48

Navigating the Cisco Cloud Network Controller GUI

After you install Cisco Cloud Network Controller, you can use it for extending Cisco Application Centric Infrastructure (ACI) policy to the Google Cloud. You do so through the Cisco Cloud Network Controller GUI.

In the Cisco Cloud Network Controller GUI, you can create a tenant, configure application profiles, endpoint groups (EPGs), contracts, filters, and VRFs. You can also view Cisco Cloud Network Controller topology, configurations, and resources.

You perform configuration steps with the. **Intent** feature. For instructions on using the **Intent** feature, see the section Configuring Cisco Cloud Network Controller Components, on page 48. Also see the section "Understanding the Cisco Cloud Network Controller GUI Icons" in the *Cisco Cloud Network Controller User Guide*.

The steps for performing basic tasks in Cisco Cloud Network Controller differ from the steps in regular Cisco APIC. However, the functions of the tenant, application profile, and other elements of Cisco APIC are the same. For more information, see the *Cisco Application Centric Infrastructure Fundamentals Guide* on Cisco.com.

You view configurations and other information with the left navigation pane. You can choose **Dashboard** (the default view), **Topology**, **Application Management**, **Cloud Resources**, **Operations**, **Infrastructure**, and **Administrative**.

For information abut the icons, see the section "Understanding the Cisco Cloud Network Controller GUI Icons" in the *Cisco Cisco Cloud Network Controller User Guide* on Cisco.com.

Creating a Tenant Using the Cisco Cloud Network Controller GUI

The following sections describe how to create a tenant using the Cisco Cloud Network Controller GUI.

Configuring Cisco Cloud Network Controller Components

This section provides an overview of performing key tasks in Cisco Cloud Network Controller, including creating a tenant, application profile, and endpoint group (EPG).

Before you begin

You must have installed Cisco Cloud Network Controller. See the previous installation sections in this guide.

Step 1 Log into Cisco Cloud Network Controller.

Step 2 At the upper right of the **Dashboard** pane, click the icon with an arrow pointing to a bull's-eye.

This icon might be referred to as the **Intent** icon or feature.

Step 3 In the **What do you want to do?** window, type a term in the search window to bring up a list of options.

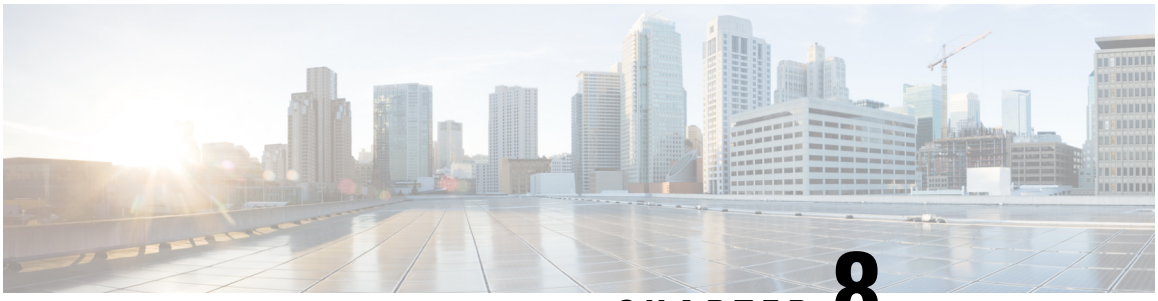
For example, if you want to configure a tenant, type the word tenant in the search window. The search returns a list of tasks that are related to creating and configuring tenants.

Step 4 Click a task and perform the configuration steps in the windows that open.

What to do next

You can view the configuration in the left navigation pane. Expand the pane by clicking the hamburger icon at the upper left of the **Dashboard** pane. Expand the appropriate heading to view the configurations.

For example, if you've configured a tenant, expand **Application Management** and click **Tenants**. Information about tenants appears in the central work pane.



CHAPTER 8

Logging Into Cisco Cloud Network Controller Through SSH

Normally, you will log into your Cisco Cloud Network Controller through a browser, as described in Configuring Cisco Cloud Network Controller Using the Setup Wizard, on page 25. If you need to log into your Cisco Cloud Network Controller through SSH for any reason, however, the following sections describe how to log into the Cisco Cloud Network Controller using the SSH keys that you generated in the previous sections or using SSH password authentication.

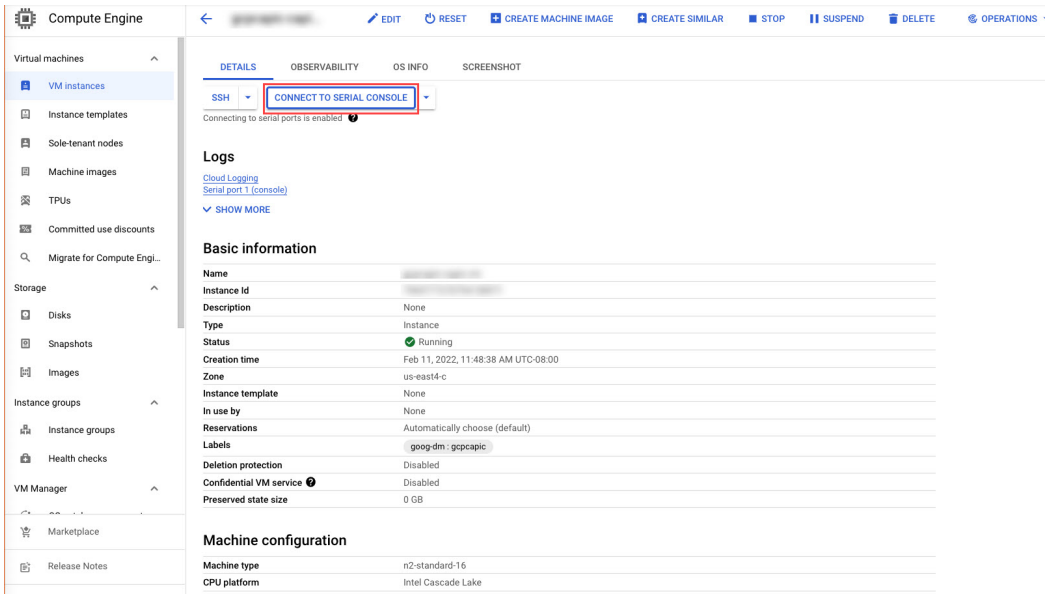
- Connecting To Serial Console Through Google Cloud, on page 49
- Log Into Cisco Cloud Network Controller Using SSH Keys, on page 50
- Log Into Cisco Cloud Network Controller Using SSH Password Authentication, on page 51

Connecting To Serial Console Through Google Cloud

You can connect to the serial console through Google Cloud by navigating here:

Virtual Machines > **VM instances**

In the **VM instances** page, click on the **Instances** tab and then click the instance for the Cisco Cloud Network Controller, then click on **CONNECT TO SERIAL CONSOLE**.



Note Connecting to serial console is the only operation that is allowed in this Google Cloud page. For example, attempting to SSH into Cisco Cloud Network Controller through this page in Google Cloud is not permitted. You can SSH into Cisco Cloud Network Controller through the other methods described in Logging Into Cisco Cloud Network Controller Through SSH, on page 49.

Log Into Cisco Cloud Network Controller Using SSH Keys

Step 1 Log into your Google Cloud account for the Cisco Cloud Network Controller infra tenant.

Step 2 Locate the IP address for your Cisco Cloud Network Controller.

The management IP address shown at the end of the output from the Deployment Manager in Deploying the Cisco Cloud Network Controller in Google Cloud, on page 13.

You can also locate the IP address for your Cisco Cloud Network Controller by navigating to **Compute Engine** > **VM instances**. The IP address shown in the **External IP** column is the IP address for your Cisco Cloud Network Controller.

Step 3 For Linux systems, enter the following to log into your Cisco Cloud Network Controller using the SSH keys.

```
# ssh -i ~/.ssh/cnc-ssh-key admin@public-IP-address
```

For example:

```
# ssh -i ~/.ssh/cnc-ssh-key admin@192.0.2.1
```

See Generating an SSH Key Pair in Linux or MacOS, on page 12 for more information on the location and format of the public key file.

Log Into Cisco Cloud Network Controller Using SSH Password Authentication

Unlike SSH using a public key, SSH Password Authentication is disabled by default. Use these procedures to enable SSH Password Authentication so that you can SSH into your Cisco Cloud Network Controller with a username and password.

Step 1 Open a browser window and, using the secure version of HTTP (`https://`), paste the IP address into the URL field, then press Return to access this Cisco Cloud Network Controller.

For example, `https://192.0.2.1`.

Step 2 Enter the following information in the login page for the Cisco Cloud Network Controller:

- **Username**: Enter admin for this field.
- **Password**: Enter the password that you provided to log into the Cisco Cloud Network Controller.
- **Domain**: If you see the Domain field, leave the default Domain entry as-is.

Step 3 Click **Login** at the bottom of the page.

Step 4 Navigate to **Infrastructure** > **System Configuration**, then click the **Management Access** tab in the **System Configuration** page.

Step 5 Click the pencil icon in the upper right corner of the screen to edit the SSH settings.

The Settings page appears for SSH.

Step 6 In the Password Authentication State field, select Enabled.

Step 7 Click **Save**.

You can now SSH into your Cisco Cloud Network Controller without having to access the public and private key files:

```
# ssh admin@192.0.2.1
```