Configure System Settings

About System Settings

To start using Cisco DNA Center, you must first configure the system settings so that the server can communicate outside the network, ensure secure communications, authenticate users, and perform other key tasks. Use the procedures described in this chapter to configure the system settings.

Note Any changes that you make to the Cisco DNA Center configuration—including changes to the proxy server settings—must be done from the Cisco DNA Center GUI, and the changes to the IP address, static route, DNS server, or **maglev** user password—must be done from the CLI with the `sudo maglev-config update` command.

Use the System 360

The **System 360** tab provides at-a-glance information about Cisco DNA Center.

Step 1 Click the menu icon (☰) and choose **System** > **System 360**.

Step 2 On the **System 360** dashboard, review the following displayed data metrics:

Cluster

- **Hosts**: Displays information about the Cisco DNA Center hosts. The information that is displayed includes the IP address of the hosts and detailed data about the services running on the hosts. Click the **View Services** link to view detailed data about the services running on the hosts.

  Note The host IP address has a color badge next to it. A green badge indicates that the host is healthy. A red badge indicates that the host is unhealthy.

  The side panel displays the following information:

  - **Node Status**: Displays the health status of the node.

    If the node health is unhealthy, hover over the status to view additional information for troubleshooting.

  - **Services Status**: Displays the health status of the services. Even if one service is down, the status is **Unhealthy**.
  - **Name**: Service name.
  - **Appstack**: App stack name.

    An app stack is a loosely coupled collection of services. A service in this environment is a horizontally scalable application that adds instances of itself when demand increases, and frees instances of itself when demand decreases.

  - **Health**: Status of the service.

- **Version**: Version of the service.
- **Tools**: Displays metrics and logs for the service. Click the **Metrics** link to view service monitoring data in Grafana. Grafana is an open-source metric analytics and visualization suite. You can troubleshoot issues by reviewing the service monitoring data. For information about Grafana, see https://grafana.com/. Click the **Logs** link to view service logs in Kibana. Kibana is an open-source analytics and visualization platform. You can troubleshoot issues by reviewing the service logs. For information about Kibana, see https://www.elastic.co/products/kibana.

- **High Availability**: Displays whether HA is enabled and active.

  Important Three or more hosts are required for HA to work in Cisco DNA Center.

- **Cluster Tools**: Lets you access the following tools:
  - **Service Explorer**: Access the app stack and the associated services.
  - **Monitoring**: Access multiple dashboards of Cisco DNA Center components using Grafana, which is an open-source metric analytics and visualization suite. Use the **Monitoring** tool to review and analyze key Cisco DNA Center metrics, such as memory and CPU usage. For information about Grafana, see https://grafana.com/.

    Note In a multihost Cisco DNA Center environment, expect duplication in the Grafana data due to the multiple hosts.

  - **Log Explorer**: Access Cisco DNA Center activity and system logs using Kibana. Kibana is an open-source analytics and visualization platform designed to work with Elasticsearch. Use the **Log Explorer** tool to review detailed activity and system logs. In the Kibana left navigation pane, click **Dashboard**. Then, click **System Overview** and view all of the system logs. For information about Kibana, see https://www.elastic.co/products/kibana.

    Note All logging in Cisco DNA Center is enabled, by default.

  - **Workflow**: Access the Workflow Visualizer, which provides detailed graphical representations of Cisco DNA Center infrastructure tasks, including Success, Failure, and Pending status markings. Use the Workflow tool to determine the location of a failure in a Cisco DNA Center task.

System Management

- **Software Updates**: Displays the status of application or system updates. Click the **View** link to view the update details.

  Note An update has a color badge next to it. A green badge indicates that the update or actions related to the update succeeded. A yellow badge indicates that there is an available update.

- **Backups**: Displays the status of the most recent backup. Click the **View** link to view all backup details.

  Additionally, it displays the status of the next scheduled backup (or indicates that no backup is scheduled).

  Note A backup has a color badge next to it. A green badge indicates a successful backup with a timestamp. A yellow badge indicates that the next backup is not yet scheduled.

- **Application Health**: Displays the health of automation and Assurance.

  Note Application health has a color badge next to it. A green badge indicates a healthy application. A red badge indicates that the application is unhealthy. Click the **View** link to troubleshoot.

Externally Connected Systems

Displays information about external network services used by Cisco DNA Center.

- **Identity Services Engine (ISE)**: Displays Cisco ISE configuration data, including the IP address and status of the primary and secondary Cisco ISE servers. Click the **Configure** link to configure Cisco DNA Center for integration with Cisco ISE.
- **IP Address Manager (IPAM)**: Displays IP address manager configuration data and the integration status. Click the **Configure** link to configure the IP Address Manager.
- **vManage**: Displays vManage configuration data. Click the **Configure** link to configure vManage.

View the Services in System 360

The **System 360** tab provides detailed information about the app stacks and services running on Cisco DNA Center. You can use this information to assist in troubleshooting issues with specific applications or services. For example, if you are having issues with Assurance, you can view monitoring data and logs for the NDP app stack and its component services.

Step 1 Click the menu icon (☰) and choose **System** > **System 360**.

Step 2 On the **System 360** tab, in the **Cluster Tools** area, click **Service Explorer**.

The node clusters and the associated services are displayed in a tree-like structure in a new browser window.

- Hover over the node to view the node cluster health status. The healthy node clusters are marked in green. Unhealthy node clusters are marked in red.
- The Services table shows all the services associated with the node. The managed services are marked as (M).
- In the Service table, click the global filter icon to filter services by app stack name, service health status (Up, Down, or In Progress), or managed services.
- Enter a service name in the Global Search field to find a service. Click the service name to view the service in its associated node.

Step 3 Click the service to launch the Service 360 view, which displays the following details:

- **Name**: Service name.
- **Appstack**: App stack name.
- **Version**: Version of the service.
- **Health**: Status of the service.
- **Metrics**: Click the link to view the services monitoring data in Grafana.
- **Logs**: Click the link to view the service logs in Kibana.
- **Required Healthy Instances**: Shows the number of healthy instances and indicates whether the service is managed.
- **Instances**: Click the instances to view details.

Step 4 Enter the service name in the Search field to search the services listed in the table.

Step 5 Click the filter icon in the services table to filter services based on app stack name, service status (Up, Down, or In Progress), or managed service.

Monitor System Health

From the **System Health** page, you can monitor the health of the physical components on your Cisco DNA Center appliances and keep tabs on any issues that may occur. Refer to the following topics, which describe how to enable this functionality and use it in your production environment.

Establish Cisco IMC Connectivity

To enable the **System Health** page, you need to establish connectivity with Cisco Integrated Management Controller (Cisco IMC), which collects health information for your appliances' hardware. Complete the following procedure to do so.

Note Only users with SUPER-ADMIN-ROLE permissions can enter Cisco IMC connectivity settings for an appliance.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **System Configuration** > **System Health Notifications**.

The IP address of each appliance in your cluster is listed in the **Cisco DNA Center Address** column.

Step 2 Configure the information required to log in to Cisco IMC:

a) Click the IP address for an appliance.

The **Edit Cisco DNA Center Server Configuration** slide-in pane opens.

b) Enter the following information and then click **Save**:

- The IP address configured for the appliance's Cisco IMC port.
- The username and password required to log in to Cisco IMC.

c) Repeat this step for the other appliances in your cluster, if necessary.

Delete Cisco IMC Settings

To delete the Cisco IMC connectivity settings that have been configured previously for a particular appliance, complete the following procedure.

Note Only users with SUPER-ADMIN-ROLE permissions can delete these settings.

Step 1 Click the menu icon ( ) and choose **System** > **Settings** > **System Configuration** > **System Health Notifications**.

Step 2 For the appliance whose settings you want to delete, click its **Delete** ( ) icon in the **Actions** column.

Step 3 At the confirmation prompt, click **Ok**.

Subscribe to System Event Notifications

After you have established connectivity with Cisco IMC, Cisco DNA Center collects event information from Cisco IMC and stores this information as raw system events. These raw events are then processed by the rules engine and converted into system event notifications that are displayed in the System Health topology. By completing the procedure described in the Cisco DNA Center Platform User Guide's "Work with Event Notifications" topic, you can also receive these notifications in one of the available formats. When completing this procedure, select and subscribe to the following events:

- Certificate expiration events:
  - SYSTEM-CERTIFICATE
  - SYSTEM-NODE-CERTIFICATE
- Connected external systems events:
  - SYSTEM-EXTERNAL-CMX
  - SYSTEM-EXTERNAL-IPAM
  - SYSTEM-EXTERNAL-ISE-AAA-TRUST
  - SYSTEM-EXTERNAL-ISE-PAN-ERS
  - SYSTEM-EXTERNAL-ISE-PXGRID
  - SYSTEM-EXTERNAL-ITSM
- Disaster recovery system events: SYSTEM-DISASTER-RECOVERY
- General system events:
  - SYSTEM-CIMC
  - SYSTEM-CONFIGURATION
  - SYSTEM-HARDWARE
  - SYSTEM-MANAGED-SERVICES

Note For managed services, the probe interval (the time it takes for Cisco DNA Center to delete stale events from its database) is 60 minutes. When managed services have been down and become active again, it will take this long for the System Health GUI to reflect that the services have been restored.

- SYSTEM-SCALE-LIMITS

Event Notification Information

The following table lists the key information that Cisco DNA Center provides when it generates a system health notification message.

Domain	Subdomain	Tag	Instance	State	Message
System	CPU	CPU	<*node-hostname*>:CPU-1	Ok	Cisco DNA Center CPU-1 is working as expected on <*node-hostname*>
				NotOk	Cisco DNA Center CPU-1 has failed on <*node-hostname*>
				Disabled	Cisco DNA Center CPU-1 is disabled on <*node-hostname*>
	Memory	Memory	<*node-hostname*>:DIMM_A1	Ok	Cisco DNA Center RAM DIMM_A1 is working as expected on <*node-hostname*>
				NotOk	Cisco DNA Center RAM DIMM_A1 has failed on <*node-hostname*>
	Disk	Disk	<*node-hostname*>:Disk-1	Ok	Cisco DNA Center Disk 2 is working as expected on <*node-hostname*>
				NotOk	Cisco DNA Center Disk 2 has failed on <*node-hostname*>
	RAID Controller	RAIDController	<*node-hostname*>:Controller-1	Ok	Cisco DNA Center RAID VD-2 is working as expected on <*node-hostname*>
				NotOk	Cisco DNA Center RAID VD-2 has degraded on <*node-hostname*>
				Disabled	Cisco DNA Center RAID VD-2 is offline on <*node-hostname*>
	Network Interfaces	NIC	<*node-hostname*>:nic-1	Ok	Cisco DNA Center network interfaces are working as expected
				NotOk	Cisco DNA Center: <*x*> network interfaces are missing for <*node-hostname*>: nic-1
	PSU_FAN	PSU	<*node-hostname*>:psu-1	Ok	Cisco DNA Center power supply (PSU-1) is powered on and thermal condition is normal for <*node-hostname*>
				NotOk	Cisco DNA Center power supply (PSU-2) is powered off and thermal condition is critical for <*node-hostname*>
	Disaster Recovery	DisasterRecovery	<*disaster-recovery-hostname*>	Ok	• Disaster recovery cluster is up • Disaster recovery failover succeeded to <*site-name*>
				Degraded	

Domain	Subdomain	Tag	Instance	State	Message
					• Disaster recovery failover triggered from <*site-name*> to *site-name* • Disaster recovery failed while failing over to <*site-name*> • Disaster recovery standby cluster on <*site-name*> is down; cannot failover • Disaster recovery witness is down; cannot failover • Disaster recovery replication halted; recovery point objective will be impacted • Disaster recovery pause failed • Disaster recovery route advertisement failed • Disaster recovery IPSec communication failed
				NotOk	• Disaster recovery configuration failed • Disaster recovery failed to rejoin the standby system
	Platform Services	ManagedServices	<hostname>:<name>	OK	Managed Service <*service-name*> is Running
				NOTOK	Managed Service <*service-name*> is Interrupted
	Scale Limits	wired_concurrent_clients	<hostname>:<name>	OK	OK
				NOTOK	The number of concurrent wired clients exceeded 26250 (105% of limit)
				DEGRADED	The number of concurrent wired clients exceeded 21250 (85% of limit)
				CAUTION	The number of concurrent wired clients exceeded 18750 (75% of limit)
		wireless_concurrent_clients	<hostname>:<name>	OK	OK
				NOTOK	

Domain	Subdomain	Tag	Instance	State	Message
					The number of concurrent wireless clients exceeded 18750 (75% of limit)
				DEGRADED	The number of concurrent wireless clients exceeded 21250 (85% of limit)
				CAUTION	The number of concurrent wireless clients exceeded 18750 (75% of limit)
		wired_devices	<hostname>:<name>	OK	OK
				NOTOK	The number of wired devices exceeded 1050 (105% of limit)
				DEGRADED	The number of wired devices exceeded 850 (85% of limit)
				CAUTION	The number of wired Devices exceeded 750 (75% of limit)
		wireless_devices	<hostname>:<name>	OK	OK
				NOTOK	The number of wireless devices exceeded 3800 (105% of limit)
				DEGRADED	The number of wireless devices exceeded 3400 (85% of limit)
				CAUTION	The number of wireless devices exceeded 3000 (75% of limit)
		interfaces	<hostname>:<name>	OK	OK
				NOTOK	The number of interfaces exceeded 1140000000 (95% of limit)
				DEGRADED	The number of interfaces exceeded 1020000000 (85% of limit)
				CAUTION	The number of interfaces exceeded 900000000 (75% of limit)
		ippools	<hostname>:<name>	OK	OK
				NOTOK	The number of IP pools exceeded 47500 (95% of limit)
				DEGRADED	The number of IP pools exceeded 42500 (85% of limit)
				CAUTION	The number of IP pools exceeded 37500 (75% of limit)
		netflows	<hostname>:<name>	OK	OK
				NOTOK	

Domain	Subdomain	Tag	Instance	State	Message
					The number of Netflows exceeded 37500 (75% of limit)
				DEGRADED	The number of Netflows exceeded xxx (x% of limit)
				CAUTION	The number of Netflows exceeded yyy (y% of limit)
		physical_ports	<hostname>:<name>	OK	OK
				NOTOK	The number of physical ports exceeded 50400 (95% of limit)
				DEGRADED	The number of physical ports exceeded 40800 (85% of limit)
				CAUTION	The number of physical ports exceeded 36000 (75% of limit)
		policy	<hostname>:<name>	OK	OK
				NOTOK	The number of policies exceeded 23750 (95% of limit)
				DEGRADED	The number of policies exceeded 21250 (85% of limit)
				CAUTION	The number of policies exceeded 18750 (75% of limit)
		scalable_group	<hostname>:<name>	OK	OK
				NOTOK	The number of scalable groups exceeded 3800 (95% of limit)
				DEGRADED	The number of scalable groups exceeded 3400 (85% of limit)
				CAUTION	The number of scalable groups exceeded 3000 (75% of limit)
		sites	<hostname>:<name>	OK	OK
				NOTOK	The number of sites exceeded 475 (95% of limit)
				DEGRADED	The number of sites exceeded 425 (85% of limit)
				CAUTION	The number of sites exceeded 375 (75% of limit)
		transient_clients	<hostname>:<name>	OK	OK
				NOTOK	The number of transient clients exceeded 71250 (95% of limit)
				DEGRADED	

Domain	Subdomain	Tag	Instance	State	Message
					The number of transient clients exceeded 63750 (85% of limit)
				CAUTION	The number of transient clients exceeded 56250 (75% of limit)
	Software Upgrade	Upgrade	<hostname>:<name>	OK	Successfully finished downloading package <*package-name*> with version <*package-version*>
				NOTOK	Catalog package download failed for <*package-name*>
	Backup	Backup	<hostname>:<name>	OK	Successfully completed backup
				NOTOK	Failed to backup
	Restore	Restore	<hostname>:<name>	OK	Successfully restored
				NOTOK	Failed to restore configuration
Connectivity	ISE	ISE_ERS	<*Cisco-ISE-hostname*>	Success	ISE AAA trust establishment succeeded for ISE server <*ISE-server-details*>
				Failed	ISE AAA trust establishment failed for ISE server <*ISE-server-details*>

Domain	Subdomain	Tag	Instance	State	Message
Integrations	IPAM	IPAM	<*IPAM-hostname*>	Ok	IPAM connection to Cisco DNA Center established. IPAM <*IPAM-IP-address*>.
				Critical	IPAM connection to Cisco DNA Center offline. IPAM <*IPAM-IP-address*>.
	ISE	ISE_AAA	<*Cisco-ISE-hostname*>	Up	ISE AAA trust establishment succeeded for ISE server. ISE <*ISE-IP-address*>
				Down	ISE AAA trust establishment failed for ISE server. ISE <*ISE-IP-address*>
	CMX	CMX	<*CMX-hostname*>	serviceAvailable	CMX connection to Cisco DNA Center offline. CMX <*CMX-IP-address*>.
				serviceNotAvailable	CMX connection to Cisco DNA Center offline. CMX <*CMX-IP-address*>.
	ITSM	ITSM	<*ITSM-hostname*>	Up	ITSM connection to Cisco DNA Center offline. ITSM <*ITSM-IP-address*>.
				Down	ITSM connection to Cisco DNA Center offline. ITSM <*ITSM-IP-address*>.

System Health Scale Numbers

The following versions of the second-generation Cisco DNA Center appliance are available:

- 44-core appliance: Cisco part number DN2-HW-APL
- 44-core promotional appliance: Cisco part number DN2-HW-APL-U
- 56-core appliance: Cisco part number DN2-HW-APL-L
- 56-core promotional appliance: Cisco part number DN2-HW-APL-L-U
- 112-core appliance: Cisco part number DN2-HW-APL-XL
- 112-core promotional appliance: Cisco part number DN2-HW-APL-XL-U

System Health monitors these appliances and generates a notification whenever a network component listed in the following table exceeds a particular threshold. The priority of the notification that's generated depends on the percentage of a threshold that's been measured:

- When 75% of a threshold has been exceeded, an information (P3) notification is generated.
- When 85% of a threshold has been exceeded, a warning (P2) notification is generated.
- When 95% of a threshold has been exceeded, a critical (P1) notification is generated.

Note 1,000,000 notifications are maintained in the audit log for every appliance (regardless of type) and are stored for one year.

Network Component	44-Core Appliance	56-Core Appliance	112-Core Appliance
Wired devices (routers, switches, stacks, and wireless LAN controllers)	1,000	2,000	5,000
Wireless devices (access points and sensors)	4,000	6,000	18,000
Physical ports in inventory	48,000	192,000	480,000
Logical and physical interfaces	1,200,000	1,200,000	1,200,000
Wired clients (concurrent)	25,000	40,000	40,000
Wireless clients (concurrent)	25,000	40,000	60,000
Transient clients	75,000	120,000	250,000
Sites	500	1,000	2,000
Incoming NetFlows	27,500	60,000	120,000
IP pools	50,000	100,000	100,000
Policy matrix size	25,000	25,000	25,000

View the System Topology

From the **System Health** window's topology, you can view a graphical representation of your Cisco DNA Center appliances and the external systems that are connected to your network, such as Cisco Connected Mobile Experiences (Cisco CMX) and Cisco Identity Services Engine (Cisco ISE). Here, you can quickly identify any network components that are experiencing an issue and require further attention. In order to populate this page with appliance and external system data, you must first complete the tasks described in the following topics:

- Establish Cisco IMC Connectivity, on page 5
- Subscribe to System Event Notifications, on page 6

To view this page, click the menu icon (≡) in the Cisco DNA Center GUI and choose **System** > **System Health**. Topology data is polled every 30 seconds. If any new data is received, the topology automatically updates to reflect this data.

Note the following:

- Cisco DNA Center now supports IPv6. When viewing a cluster on which IPv6 is enabled, the topology also displays the following information for that cluster's Enterprise virtual IP address:

- **Pre** field: 16-bit prefix
- **GID** field: 32-bit global ID
- **Subnet** field: 16-bit subnet value

The remainder of the cluster's Enterprise virtual IP address is used to label its topology icon.

- An IPv6-enabled cluster can only connect to and retrieve data from external systems that also support IPv6.
- Whenever a connected appliance or external system has a certificate installed that's set to expire, the topology does the following:
  - If a certificate is set to expire within 90 days, the topology displays a warning.
  - If a certificate is set to expire within 30 days, the topology displays an error to bring your attention to the issue.
- System Health runs a hardware compliance check regularly and indicates whenever a connected appliance or external system does not meet the minimum configuration requirements. For example, System Health updates the topology to indicate when the **Write Through** cache write policy is not set for a connected virtual drive.
- If disaster recovery is operational in your production environment, System Health now provides hardware information for the appliances at both the main and recovery site. Previously, hardware information was provided only for main site appliances.

Troubleshoot Appliance and External System Issues

When viewing the System Health topology, the minor issue icon ( ) and major issue icon ( ) indicate network components that require attention. To begin troubleshooting the issue that a component is experiencing, place your cursor over its topology icon to open a pop-up window that displays the following information:

- A timestamp that indicates when the issue was detected.
- If you are viewing the pop-up window for a Cisco DNA Center appliance, the Cisco IMC firmware version that is installed on the appliance.
- A brief summary of the issue.
- The current state or severity of the issue.
- The domain, subdomain, and IP address or location associated with the issue.

If you open the pop-up window for a connected external system that has three or more associated servers or a Cisco DNA Center appliance that has three or more hardware components that are experiencing an issue, the **More Details** link is displayed. Click the link to open a slide-in pane that lists the relevant servers or components. You can then view information for a specific item by clicking > to maximize its entry.

Troubleshoot External System Connectivity Issues

If Cisco DNA Center is currently unable to communicate with an external system, do the following to ping that system and troubleshoot why it cannot be reached.

Before you begin

Do the following before you complete this procedure:

- Install the Machine Reasoning package. See "Download and Install Packages and Updates" in the Cisco DNA Center Administrator Guide.
- Create a role that has write permission to the Machine Reasoning function and assign that role to the user that will complete this procedure. To access this parameter in the **Create a User Role** wizard, expand the **System** row in the **Define the Access** page. For more information, see "Configure Role-Based Access Control" in the Cisco DNA Center Administrator Guide.

Step 1 From the top-right portion of the **System Health** window, choose **Tools** > **Network Ping** to open the **Ping Device** window.

The window lists all of the devices that Cisco DNA Center currently manages.

Step 2 Click the radio button for any device whose reachability status is **Reachable** and then click the **Troubleshoot** link.

The **Reasoner Inputs** pop-up window opens.

Step 3 In the **Target IP Address** field, enter the IP address of the external system that cannot be reached.

Step 4 Click **Run Machine Reasoning**.

A dialog box is displayed after Cisco DNA Center has pinged the external system.

Step 5 Click **View Details** to see whether the ping was successful.

Step 6 If the ping failed, click the **View Relevant Activities** link to open the **Activity Details** slide-in pane and then click the **View Details** icon.

The **Device Command Output** pop-up window opens, listing possible causes for the inability to reach the external system.

Use the Validation Tool

The validation tool tests both Cisco DNA Center appliance hardware and connected external systems and identifies any issues that need to be addressed before they seriously impact your network. The validation process makes numerous checks, such as:

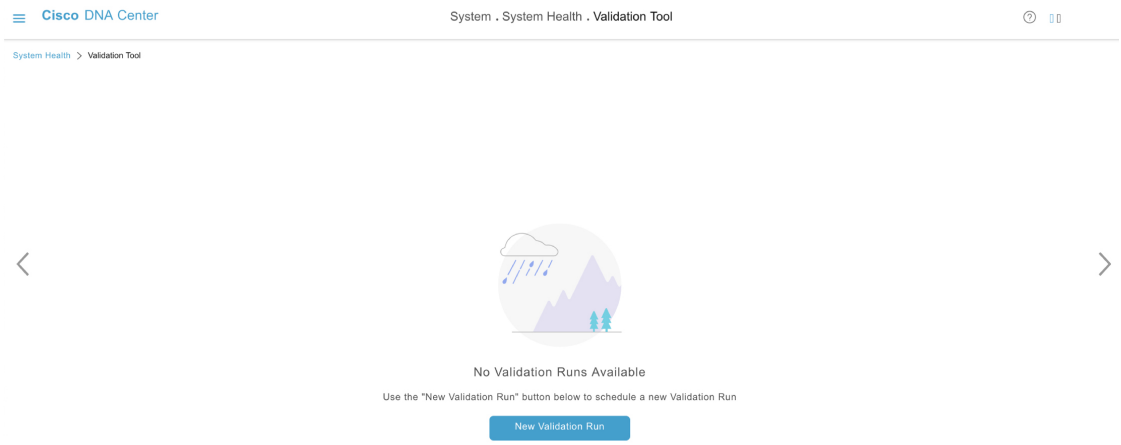
- The ability to connect to ciscoconnectdna.com (in order to download system and package updates).
- The presence of expiring certificates.
- The current health of appliance hardware and back-end services.
- The network components that have exceeded a scale number threshold.

To access the validation tool, do the following:

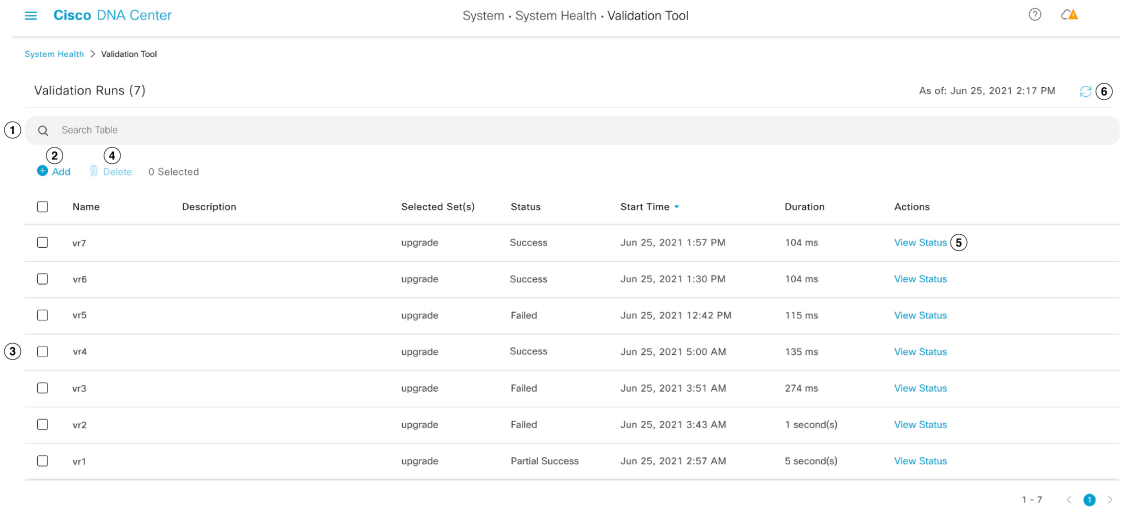
1. Click the menu icon (☰) and choose **System** > **System Health** to open the **System Health** page.
2. From the **Tools** drop-down menu, choose **Validation Tool**.

Navigate the Validation Tool Page

The contents of the **Validation Tool** page depend on whether Cisco DNA Center has information for any validation runs that completed previously. If it doesn't, the page looks like this:



If Cisco DNA Center does have validation run information, the page looks like this:



The following table describes the components that make up the **Validation Tool** page and their function when validation run information is available.

Callout	Description
1	**Search Table** field: Enter a search string to filter the validation runs that are listed on this page.
2	**Add** button: Click to open the **New Validation Run** slide-in pane and enter the required settings for a new run. For more information, see Start a Validation Run, on page 18.

Callout	Description
3	**Validation Runs** table: Lists the validation runs that completed previously. For each run, the table provides information such as its name, applicable validation set, and completion status. Note the following points: • By default, the runs are ordered by start time, with the most recent run listed first. • A duration of zero is listed for any run that's currently in progress.
4	**Delete** button: With the check box for a validation run checked, click to delete the run. Then click **Ok** in the **Warning** dialog box to confirm deletion. **Note** You cannot delete a run that is in progress.
5	**View Status** link: Click to view the details for a particular run. For more information, see View Validation Run Details, on page 19.
6	**Refresh** button: Click to refresh the information that's displayed on this page.

Start a Validation Run

To start a validation run, complete the following steps.

Note Only one validation run can take place at a time. If a validation run is already in progress, you'll need to wait until it completes before you can initiate another run.

Step 1 Do one of the following in the **Validation Tool** window, depending on whether the **Validation Runs** table is displayed:

- If the table is not displayed, it means that either previous validation runs have been deleted or a validation run hasn't been completed yet. Click **New Validation Run**.
- If the **Validation Runs** table is displayed, click **Add**.

The **New Validation Run** slide-in pane opens.

Step 2 In the **Name** field, enter a name for the validation run.

Ensure that the name you enter is unique and contains only alphanumeric characters. Special characters are not allowed.

Step 3 (Optional) In the **Description** field, enter a brief description for the validation run you are about to start.

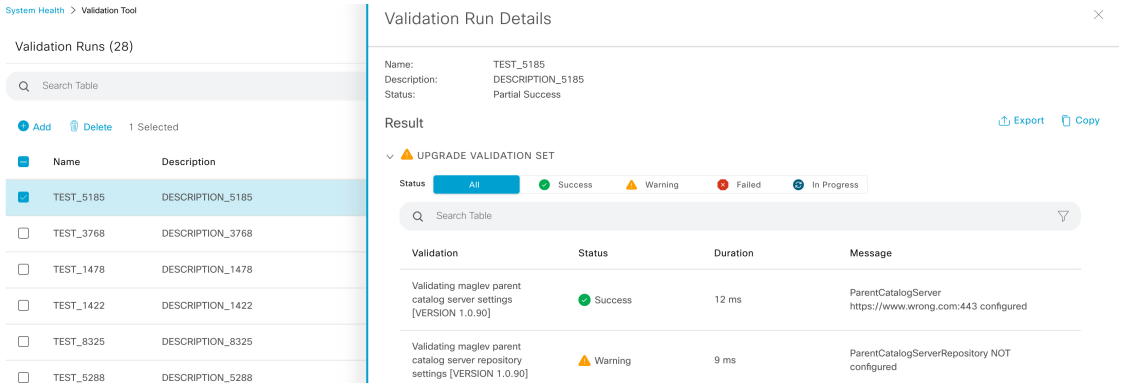
You can enter a description that contains a maximum of 250 characters.

Step 4 In the **Validation Set(s) Selection** area, check the **Upgrade Validation Set** check box if you want Cisco DNA Center to automatically update the set of system checks it makes during a validation run.

Note If you want to make this update manually, complete the steps described in Update the Validation Set, on page 19.

View Validation Run Details

From the **Validation Run Details** slide-in pane, you can view the checks that were made during the selected run, as well as their completion status, duration, and any other relevant information.



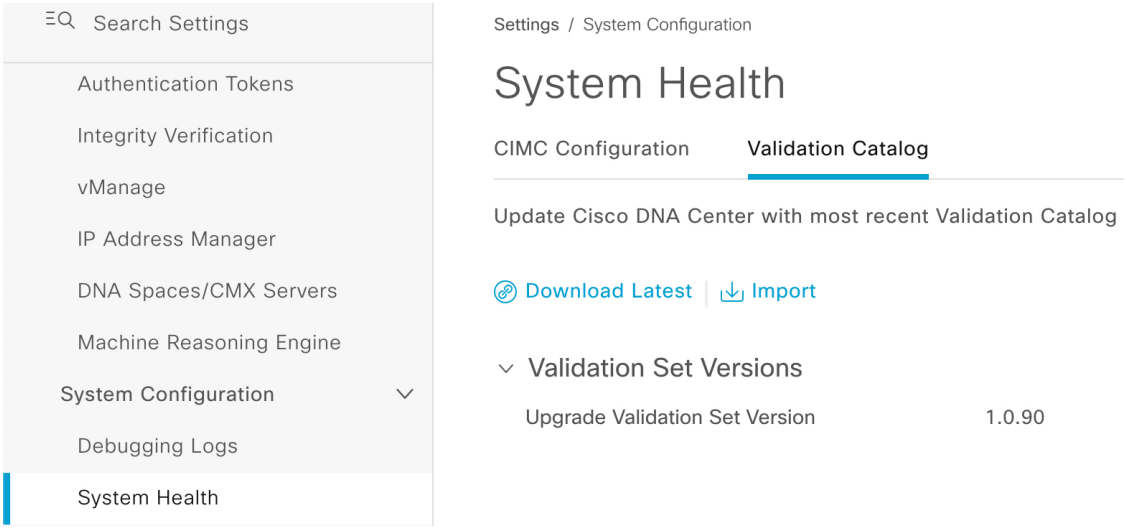
From here, you can also do the following:

- In the **Search Table** field, enter a search string to filter the information that's provided.
- Click **Export** to download the contents of this pane as a .json file.
- Click **Copy** to copy the contents of this pane.

Update the Validation Set

Complete the following steps to update the validation set that's used during validation runs.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **System Configuration** > **System Health**.

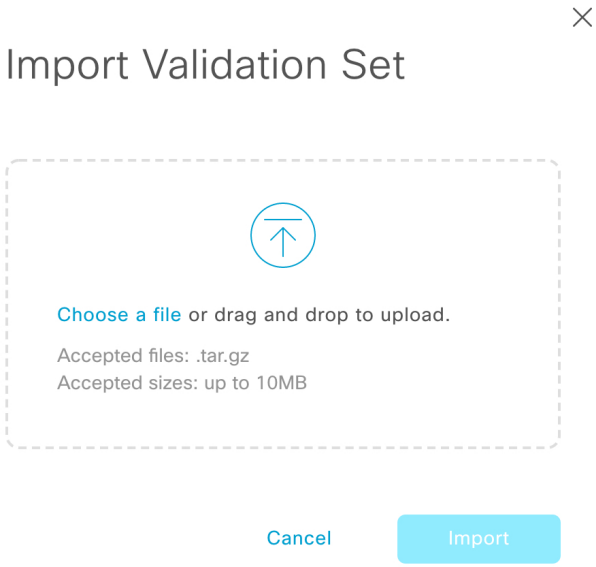


Step 2 Click the **Validation Catalog** tab.

Step 3 Click **Download Latest** to download a local copy of the latest available validation set.

Step 4 Import the validation set to Cisco DNA Center:

a) Click **Import** to open the **Import Validation Set** dialog box.



b) Do one of the following:

- Click the **Choose a file** link and navigate to the .tar file that you want to import.
- Drag and drop the appropriate .tar file from your desktop into the highlighted area.

c) Click **Import**.

Use the System Analyzer Tool

If you encounter an issue that requires troubleshooting, you can retrieve log files using the System Analyzer tool. In addition to system-level log files, you can retrieve log files that are specific to Cisco SD-Access and software image management (SWIM). To access the **System Analyzer** tool, do the following:

1. Click the menu icon and choose **System** > **System Health** to open the **System Health** window.
2. From the **Tools** drop-down menu, choose **System Analyzer**.

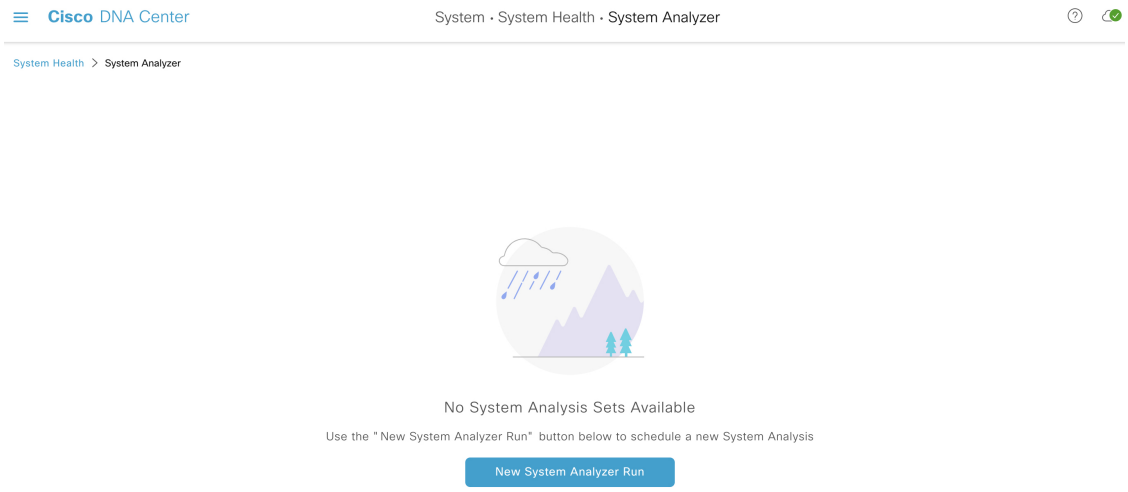
Before you use this tool, note the following points:

- Only admin users can start system analysis runs, download the resulting log files, and delete completed runs. All users can open and view the **System Analysis Details** slide-in pane for a selected run.
- The System Analyzer tool requires 5 GB of disk space on Cisco DNA Center's GlusterFS filesystem.
- Cisco DNA Center will store either 5 GB or the last 3 months' worth of system analysis runs, whichever is smaller.
- When either of the storage limits have been reached, Cisco DNA Center will delete older runs once daily. It will also delete older runs before every new run is started.
- Since log file information is only useful for troubleshooting, data for system analysis runs is not backed up.

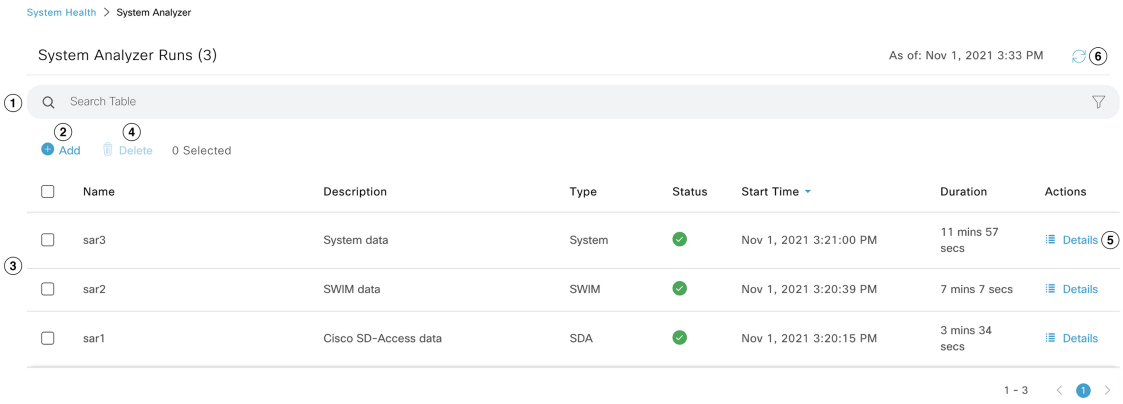
- In a deployment where HA is enabled, if the System Health service goes down while a run is in progress, you will need to restart the run after System Health is up again.
- In a deployment where disaster recovery is enabled, run data is not replicated across the disaster recovery system's sites. The system's active and standby sites will maintain their own run history.

Navigate the System Analyzer Page

The contents of the **System Analyzer** page depend on whether Cisco DNA Center has information for any runs that completed previously. If it doesn't, the page looks like this:



If Cisco DNA Center does has run information, the page looks like this:



The following table describes the components that make up the **System Analyzer** page and their function when run information is available.

Callout	Description
1	**Search Table** field: Enter a search string to filter the runs that are listed on this page.
2	**Add** button: Click to open the **New System Analyzer Run** slide-in pane and enter the required settings for a run. See Start a System Analyzer Run, on page 22 for more information.

Callout	Description
3	**System Analyzer Runs** table: Lists the runs that are currently in progress or have completed previously. For each run, the table provides information such as its name, the relevant Cisco DNA Center component, and the amount of time it took to complete the run. Note the following points: • By default, the runs are ordered by start time, with the most recent run listed first. • A duration of zero is listed for any run that's currently in-progress.
4	**Delete** button: With the check box for a run checked, click **Delete** to remove it. **Note** You cannot delete a run that is in progress.
5	**Details** link: Click to view the details for a particular run. For more information, see View System Analyzer Run Details, on page 23.
6	**Refresh** button: Click to refresh the information that's displayed on this page.

Start a System Analyzer Run

Complete the following procedure in order to start a System Analyzer run.

Step 1 Do one of the following in the **System Analyzer** page, depending on whether the **System Analyzer Runs** table is displayed:

- If the table is not displayed, it indicates that either previous runs have been deleted or a run hasn't been completed yet. Click **New System Analyzer Run**.
- If the **System Analyzer Runs** table is displayed, click **Add**.

The **New System Analyzer Run** slide-in pane opens.

Step 2 In the **Name** field, enter a name for the run.

Ensure that the name you enter is unique and only contains alphanumeric characters. Special characters are not allowed.

Step 3 In the **Description** field, enter a brief description of the run you are about to start.

You can enter a description that contains a maximum of 250 characters.

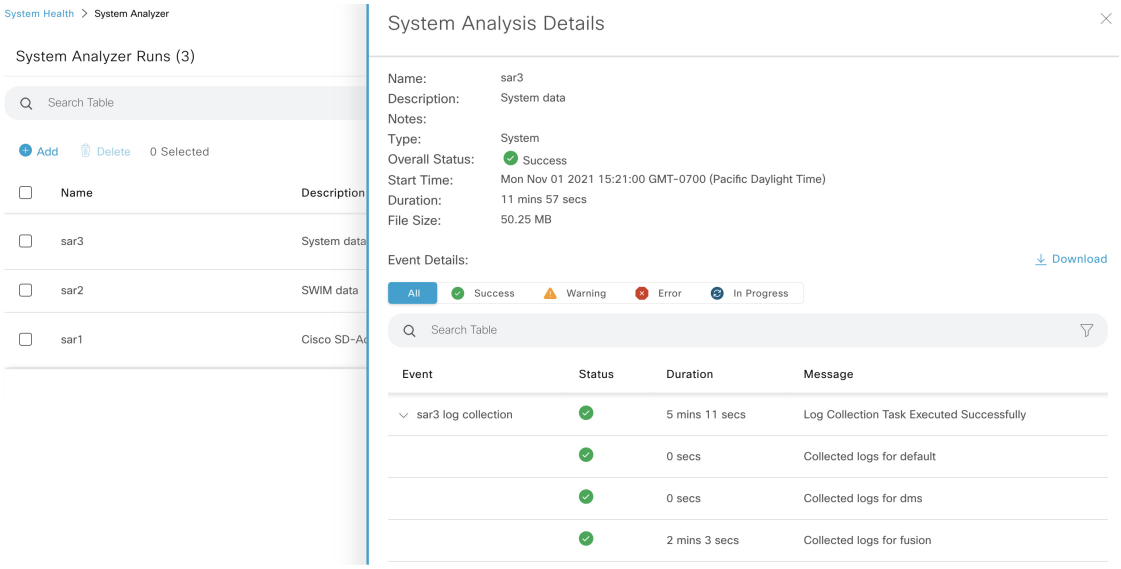
Step 4 (Optional) In the **Notes** field, enter any additional information (up to a maximum of 250 characters) you want to provide for the run.

Step 5 In the **Select a System Analyzer to run** area, click the radio button for the Cisco DNA Center component that you want to retrieve log files for.

Step 6 Click **Run**.

View System Analyzer Run Details

From the **System Analysis Details** slide-in pane, you can view additional information for the selected run, such as the total file size of the log files that were retrieved and the relevant Cisco DNA Center components. You can also identify any log files that encountered an issue during the run.



From here, you can also do the following:

- In the **Search Table** field, enter a search string to filter the information that's displayed.
- Click **Download** to download the log files that were retrieved as a .tar.gz file.

System Topology Notifications

The following tables list the various notifications that are displayed in the **System Health** page's system topology for your Cisco DNA Center appliances and any connected external systems. Notifications are grouped by their corresponding severity:

- Severity 1 (Error): Indicates a critical error, such as a disabled RAID controller or faulty power supply.
- Severity 2 (Warning): Indicates an issue such as the inability to establish trust with a Cisco ISE server.
- Severity 3: (Success): Indicates that a server or hardware component is operating as expected.

Note If all of the hardware components on an appliance are operating without any issues, an individual notification is not provided for each component. The following notification is displayed instead: `Cisco DNA Center Ok`.

Table 1: Cisco DNA Center Appliance Notifications

Component	Severity 1 Notification	Severity 2 Notification	Severity 3 Notification
CPU	Processor CPU1 (SerialNumber - *xxxxxx*) State is Disabled	Processor CPU1 (SerialNumber - *xxxxxx*) Health is NotOk and State is Enabled	Processor CPU1 (SerialNumber - *xxxxxx*) Health is Ok and State is Enabled
Disk	Driver - PD1 State is Disabled	Driver - PD1 Health is Critical and State is Enabled	Driver - PD1 Health is Ok and State is Enabled
MemoryV1	Memory Summary (TOTALSYSTEMMEMORYGIB - 256) Health is NotOk	—	Memory Summary (TOTALSYSTEMMEMORYGIB - 256) Health is Ok
MemoryV2	Storage DIMM1 (SerialNumber - *xxxxx*) Status is NotOperable	—	Storage DIMM1 (SerialNumber - *xxxxx*) Status is Operable
NIC	NIC Adapter Card MLOM State is Disabled	NIC Adapter Card MLOM State is Enabled and port0 is Down	NIC Adapter Card MLOM State is Enabled and port0 is Up
Power supply	PowerSupply PSU1 (SerialNumber - *xxxx*) State is Disabled	—	PowerSupply PSU1 (SerialNumber - *xxxx*) State is Enabled
RAID	Cisco 12G SAS Modular Raid Controller (SerialNumber - *xxxxx*) State is Disabled	Cisco 12G SAS Modular Raid Controller (SerialNumber - *xxxxx*) Health is NotOK and State is Enabled	Cisco 12G SAS Modular Raid Controller (SerialNumber - *xxxxx*) Health is OK and State is Enabled

Table 2: Connected External System Notifications

Component	Severity 1 Notification	Severity 2 Notification	Severity 3 Notification
Cisco Connected Mobile Experiences (CMX) server	—	There is a critical issue with the integrated CMX server.	CMX server is integrated and servicing.
IP address management (IPAM) server	There is a critical issue with the connected third-party IPAM provider	—	• A third-party IPAM provider is connected. • There is no third-party IPAM provider connected. • The third-party IPAM provider is currently synchronizing.
Cisco ISE—External RESTful Services (ERS)	—	ISE PAN ERS connection: ISE ERS API call unauthorized	ISE PAN ERS connection: ERS reachability with ISE - Success

Component	Severity 1 Notification	Severity 2 Notification	Severity 3 Notification
Cisco ISE—Trust	—	ISE AAA Trust Establishment: Trust Establishment Error	ISE AAA Trust Establishment: Successfully established trust and discovered PSNs from PAN
IT service management (ITSM) server	Servicenow connection health status is NOT up and running	—	Servicenow connection health status is up and running

Disk Utilization Event Notifications

System Health monitors disk utilization by the nodes in your system and sends a notification whenever utilization on any of these nodes reaches a level that can impact network operations. When utilization exceeds 75%, System Health sends a warning notification. And when utilization exceeds 85%, System Health sends a critical notification. To configure and subscribe to these notifications, complete the steps described in the Cisco DNA Center Platform User Guide's "Work with Event Notifications" topic. When completing this procedure, ensure that you select and subscribe to the **System Performance: Filesystem Utilization** event.

Note the following points regarding disk utilization monitoring:

- After you restore a backup file or upgrade Cisco DNA Center, System Health restarts the monitoring of disk utilization and collects hourly updates.
- In a three-node HA deployment, every partition that's configured on the three cluster nodes is monitored. Any notifications that are generated are specific to the relevant partition.
- In a deployment where disaster recovery is enabled, System Health monitors disk utilization by the nodes at both the active and standby site.

Suggested Actions

The following table lists the issues that you will most likely encounter while monitoring the health of your system and suggests actions you can take to remedy those issues.

Component	Subcomponent	Issue	Suggested Actions
Cisco ISE	External RESTful Services (ERS)—Reachability	Timeout elapsed (possibly because the Cisco ISE ERS API load threshold has been exceeded).	• Check your proxy configuration for a proxy server between Cisco DNA Center and Cisco ISE. • Check whether you can reach Cisco ISE from Cisco DNA Center.
		Unable to establish a connection with Cisco ISE.	• Check whether a firewall is configured. • Check your proxy configuration for a proxy server between Cisco DNA Center and Cisco ISE. • Check whether you can reach Cisco ISE from Cisco DNA Center.
	ERS—Availability	No response to ERS API call.	• Check which version of Cisco ISE is installed. • Check if ERS is enabled on Cisco ISE. See the "Enable External RESTful Services APIs" topic in the *Cisco Identity Services Engine Administrator Guide* for more information.
	ERS—Authentication	Cisco ISE ERS API call is unauthorized.	Check whether the AAA settings credentials and the Cisco ISE credentials are the same.
	ERS—Configuration	Cisco ISE certificate has been changed.	From the Cisco DNA Center GUI, reestablish trust. See the "Enable PKI in Cisco ISE" topic in the *Cisco Identity Services Engine Administrator Guide* for more information.
	ERS—Unclassified/Generic Error	An undefined diagnostic error occurred.	1. Delete the AAA settings that are currently configured in Cisco DNA Center. 2. Reenter the appropriate AAA settings. See the "Integrate Cisco ISE with Cisco DNA Center" in the *Cisco Digital Network Architecture Center Second Generation Appliance Installation Guide* for more information. 3. Reestablish trust. See the "Enable PKI in Cisco ISE" topic in the *Cisco Identity Services Engine Administrator Guide* for more information.
	Trust—Reachability	Unable to establish an HTTPS connection.	Check whether the AAA settings credentials and the Cisco ISE credentials are the same.

Component	Subcomponent	Issue	Suggested Actions
		The Cisco DNA Center endpoint URL configured for Cisco ISE certificate chain uploads is unreachable.	• Check your proxy configuration for a proxy server between Cisco DNA Center and Cisco ISE. • Check whether you can reach Cisco ISE from Cisco DNA Center.
	Trust—Configuration	Invalid Cisco ISE certificate chain.	• If necessary, regenerate the Cisco ISE internal root CA chain. See the "ISE CA Chain Regeneration" topic in the *Cisco Identity Services Engine Administrator Guide* for more information. • Ensure that the internal CA certificate chain has not been removed from Cisco ISE.
		The Cisco DNA Center endpoint URL configured for Cisco ISE certificate chain uploads is forbidden.	• Launch the URL and check whether you can access the /aaa/Cisco ISE/certificate directory on the endpoint. • Check whether the **Use CSRF Check for Enhanced Security** option is enabled in Cisco ISE. See the "Enable External RESTful Services APIs" topic in the *Cisco Identity Services Engine Administrator Guide* for more information.
	Trust—Authentication	The Cisco ISE password has expired.	• Regenerate the Cisco ISE admin password. See the "Administrative Access to Cisco ISE" topic in the *Cisco Identity Services Engine Administrator Guide* for more information. • Ensure that you can log in to the Cisco ISE GUI.
	Trust—Unclassified/Generic Error	An undefined diagnostic error occurred.	

Component	Subcomponent	Issue	Suggested Actions
			1. Delete the AAA settings that are currently configured in Cisco DNA Center. 2. Reenter the appropriate AAA settings. See the "Integrate Cisco ISE with Cisco DNA Center" in the *Cisco Digital Network Architecture Center Second Generation Appliance Installation Guide* for more information. 3. Reestablish trust. See the "Enable PKI in Cisco ISE" topic in the *Cisco Identity Services Engine Administrator Guide* for more information.
Cisco Connected Mobile Experiences (CMX) server IP address management (IPAM) server IT service management (ITSM) server	Reachability	Unable to establish connectivity with the server.	Check whether the server in question is currently down.
	Authentication	Unable to log in to the server.	Confirm that the correct login credentials are configured in Cisco DNA Center.

Component	Subcomponent	Issue	Suggested Actions
Hardware	Disk	The specified hardware component is experiencing an issue.	Replace the faulty component.
	Fan		
	Power supply		
	Memory module		
	CPU		
	Networking card		
	RAID controller		
	Networking	Interfaces are missing.	1. Connect to Cisco IMC. 2. If the PID is UCSC-C220-M4, UCSC-C220-M4S, or DN1-HW-APL, complete the following steps: a. From the main menu, choose **Compute** > **BIOS** > **Configure BIOS**. b. Click the **Advanced** tab. c. Expand **LOM and PCIe Slots Configuration**. d. Enable the disabled mLOMs and reboot the host. 3. For all other PIDs, replace the faulty component.
System configuration	Hardware configuration	You cannot specify write-back as the write cache policy for the Cisco DNA Center <*IP_address*> virtual drive. The write policy must be write-through.	1. Connect to Cisco IMC. 2. From the main menu, choose **Storage** > **Raid Controller**. 3. Click the **Virtual Drive** tab. 4. Select a virtual drive and click **Edit**. If the write policy is not write-through, update the virtual drives. The write policy must be write-through.
System resources	Storage	The specified mount directory is full.	• Clear up storage space in the current directory by removing unnecessary data. • Specify a new mount directory that has more storage space.

Supported REST APIs

System Health supports the REST APIs that are listed in the following table. To run any of these APIs, append the following URL with the API's path: https://*CDNAC-server-IP-address*/api/v1/*API-path*

Method	API Path	Description
GET	diagnostics/system/health	Displays the latest health-related events for all connected Cisco DNA Center appliances and external systems.
	diagnostics/system/health?summary=true	Displays the most recent health event with the highest severity.
	diagnostics/system/health?domain=DNAC-Appliance	Displays all hardware events for connected appliances.
	diagnostics/system/health?domain=Integrations&subdomain-AAA Trust Establishment	Displays all integration and AAA trust establishment events.
	diagnostics/system/health?limit=5	Displays the five latest health-related events.
	diagnostics/system/performance	Summarizes performance information for connected appliances, displaying averages for the past 15 minutes.
	diagnostics/system/performance?range=now-1h	Displays Key Performance Indicator (KPI) metrics for the past hour.
	diagnostics/system/performance?range=now-1d	Displays KPI metrics for the past day.
	diagnostics/system/performance?range=now-1w	Displays KPI metrics for the past week.
	diagnostics/system/performance?function=max	provide max, current value, default is average for the duration specified
	diagnostics/system/nodes/performance?range=now-1d	Displays each connected appliance's KPI metrics for the past day.
	diagnostics/system/performance?kpi=cpu,memory	Displays the CPU and Memory utilization percentages for the default duration, which is 15 minutes.
	diagnostics/system/nodes/performance/history?kpi=cpu	Displays the specified KPI's historical metrics for the default duration. When specifying multiple KPIs, separate them with a comma.
	diagnostics/system/nodes/performance/history?kpi=cpu&range=now-1d	Displays the specified KPI's historical metrics for the past day.
	/system/health/summary/	Displays the most recent severe cluster event. Cluster events include all hardware component and external subsystem events.
	/system/health/externalsubsystems/*subdomain*	Displays the most recent event for the specified subdomain. Valid subdomain values include `IPAM`, `ISE`, `CMX`, and `ITSM`.
	/system/health/hardware	Displays the most recent severe hardware event.
	/system/health/hardware/*hardware_component*	Displays the most recent event for the specified hardware component. Valid hardware component values include `CPU`, `RAID`, `MEMORY`, `POWER`, `NIC`, and `DISK`.
	/diagnostics/system/health/externalsubsystems/ISE	

Method	API Path	Description
		The output provided by this API will vary, depending on the current state of the connected Cisco ISE server. See Sample API Output, on page 32 for examples of what this output looks like.
	/diagnostics/system/health/externalsubsystems/IPAM	The output provided by this API will vary, depending on the current state of the connected Cisco Prime Network Registrar IP Address Manager (IPAM). See Sample API Output, on page 32 for examples of what this output looks like.

Sample API Output

The following tables provide examples of the output you will see when you run either the /diagnostics/system/health/externalsubsystems/ISE or /diagnostics/system/health/externalsubsystems/IPAM API.

Sample /diagnostics/system/health/externalsubsystems/ISE Output

Scenario: A Cisco ISE server has not been integrated with Cisco DNA Center.
Output:
`{`
`"DNAC-Cluster": {`
`"Status": "Warning",`
`"TooltipInfo": "No data available"`
`}`
`}`

Sample /diagnostics/system/health/externalsubsystems/ISE Output

Scenario: A Cisco ISE server has been integrated with Cisco DNA Center and is functioning properly.

Output:


```
{
"DNAC-Cluster": {
"Status": "Ok",
"Group": "ISE",
"Label": {
"hostname": "ISE-60-38.example.com",
"ip": "172.28.80.37"
},
"Family": "ExternalSystems",
"Id": 1,
"TooltipInfo": [
{
"_id": "-429109689",
"tenantId": "TNT0",
"severity": 3,
"timestamp": "1591072373412",
"source": "ISE ERS Client",
"actualState": "",
"description": "ISE PAN ERS connection : ERS reachability with ISE - Success",
"group": "ISE",
"family": "External Subsystem",
"drUsability": "No",
"state": "SUCCESS",
"eventInstanceIdentity": {
"subDomain": "ISE",
"domain": "Connectivity",
"namespace": "SystemRawEvent",
"id": "SYSTEM-EXTERNAL-ISE-PAN-ERS",
"type": "SYSTEM",
"tags": "ISE_ERS",
"event_instance_id": {
"component": "primary",
"hostname": "ISE-60-38.example.com",
"ip": "172.28.80.37"
}
}
}
]
}
}
```

Sample /diagnostics/system/health/externalsubsystems/ISE Output

Scenario: A Cisco ISE event with a `Warning` status has occurred.

Output:


```
{
"DNAC-Cluster": {
"Status": "Warning",
"Group": "ISE",
"Label": {
"hostname": "pi-system-200.example.com",
"ip": "10.197.73.213"
},
"Family": "ExternalSystems",
"Id": 1,
"TooltipInfo": [
{
"_id": "-440073227",
"tenantId": "TNT0",
"severity": 2,
"timestamp": "1591072804646",
"source": "AAA Trust Establishment",
"actualState": "",
"description": "ISE AAA Trust Establishment : Trust Establishment - Error-IP/FQDN not reachable",
"group": "ISE",
"family": "External Subsystem",
"drUsability": "No",
"state": "FAILED",
"eventInstanceIdentity": {
"subDomain": "ISE",
"domain": "Integrations",
"namespace": "SystemRawEvent",
"id": "SYSTEM-EXTERNAL-ISE-AAA-TRUST",
"type": "SYSTEM",
"tags": "ISE_AAA",
"event_instance_id": {
"hostname": "pi-system-200.example.com",
"component": "primary",
"ip": "10.197.73.213"
}
}
}
]
}
}
```

Sample /diagnostics/system/health/externalsubsystems/ISE Output

Scenario: External RESTful Services (ERS) is disabled on a connected Cisco ISE server.

Output:


```
{
    "DNAC-Cluster": {
        "Status": "Warning",
        "Group": "ISE",
        "Label": {
            "hostname": "csg-nscg-0861.example.com",
            "ip": "10.63.107.41"
        },
        "Family": "ExternalSystems",
        "Id": 1,
        "TooltipInfo": [
            {
                "_id": "-915009445",
                "tenantId": "TNT0",
                "severity": 2,
                "timestamp": "1591357663101",
                "source": "ISE ERS Client",
                "actualState": "",
                "description": "ISE PAN ERS connection : Timeout elapsed",
                "group": "ISE",
                "family": "External Subsystem",
                "state": "FAILED",
                "eventInstanceIdentity": {
                    "subDomain": "ISE",
                    "domain": "Connectivity",
                    "namespace": "SystemRawEvent",
                    "id": "SYSTEM-EXTERNAL-ISE-PAN-ERS",
                    "type": "SYSTEM",
                    "tags": "ISE_ERS",
                    "event_instance_id": {
                        "hostname": "csg-nscg-0861.example.com",
                        "component": "primary",
                        "ip": "10.63.107.41"
                    }
                }
            }
        ]
    }
}
```

Sample /diagnostics/system/health/externalsubsystems/ISE Output

Scenario: ERS is enabled on a connected Cisco ISE server.

Output:


```
{
    "DNAC-Cluster": {
        "Status": "Ok",
        "Group": "ISE",
        "Label": {
            "hostname": "csg-nscg-0861.example.com",
            "ip": "10.30.148.52"
        },
        "Family": "ExternalSystems",
        "Id": 1,
        "TooltipInfo": [
            {
                "_id": "-915009445",
                "tenantId": "TNT0",
                "severity": 3,
                "timestamp": "1591359643926",
                "source": "ISE ERS Client",
                "actualState": "",
                "description": "ISE PAN ERS connection : ERS reachability with ISE - Success",
                "group": "ISE",
                "family": "External Subsystem",
                "state": "SUCCESS",
                "eventInstanceIdentity": {
                    "subDomain": "ISE",
                    "domain": "Connectivity",
                    "namespace": "SystemRawEvent",
                    "id": "SYSTEM-EXTERNAL-ISE-PAN-ERS",
                    "type": "SYSTEM",
                    "tags": "ISE_ERS",
                    "event_instance_id": {
                        "hostname": "csg-nscg-0861.example.com",
                        "component": "primary",
                        "ip": "10.30.148.52"
                    }
                }
            }
        ]
    }
}
```


Sample /diagnostics/system/health/externalsubsystems/IPAM Output

Scenario: Cisco Prime Network Registrar IPAM is not connected to Cisco DNA Center.

Output:


```
{
"DNAC-Cluster": {
"Status": "Warning",
"TooltipInfo": "No data available"
}
}
```

Sample /diagnostics/system/health/externalsubsystems/IPAM Output

Scenario: IPAM is connected to Cisco DNA Center and is functioning properly.

Output:


```
{
"DNAC-Cluster": {
"Status": "Ok",
"Group": "IPAM Integration",
"Label": {
"hostname": "",
"ip": "192.168.101.72"
},
"Family": "ExternalSystems",
"Id": 1,
"TooltipInfo": [
{
"_id": "1328761079",
"tenantId": "TNT0",
"severity": 3,
"timestamp": "1591072639889",
"source": "INFOBLOX: https://192.168.101.72",
"actualState": "",
"description": "A third-party IPAM provider is connected.",
"group": "IPAM",
"family": "External Subsystem",
"drUsability": "No",
"state": "OK",
"eventInstanceIdentity": {
"subDomain": "IPAM Integration",
"domain": "Integrations",
"namespace": "SystemRawEvent",
"id": "SYSTEM-EXTERNAL-IPAM",
"type": "SYSTEM",
"tags": "IPAM",
"event_instance_id": {
"hostname": "",
"ip": "192.168.101.72"
}
}
}
]
}
}
```

Sample /diagnostics/system/health/externalsubsystems/IPAM Output

Scenario: IPAM is connected to Cisco DNA Center and an error has occurred.

Output:


```
{
    "DNAC-Cluster": {
        "Status": "Error",
        "Group": "IPAM Integration",
        "Label": {
            "hostname": "",
            "ip": "192.168.101.72"
        },
        "Family": "ExternalSystems",
        "Id": 1,
        "TooltipInfo": [
            {
                "_id": "1328761079",
                "tenantId": "TNT0",
                "severity": 1,
                "timestamp": "1591363687041",
                "source": "INFOBLOX: https://192.168.101.72",
                "actualState": "",
                "description": "There is a critical issue with the connected third-party IPAM provider.",
                "group": "IPAM",
                "family": "External Subsystem",
                "state": "CRITICAL",
                "eventInstanceIdentity": {
                    "subDomain": "IPAM Integration",
                    "domain": "Integrations",
                    "namespace": "SystemRawEvent",
                    "id": "SYSTEM-EXTERNAL-IPAM",
                    "type": "SYSTEM",
                    "tags": "IPAM",
                    "event_instance_id": {
                        "hostname": "",
                        "ip": "192.168.101.72"
                    }
                }
            }
        ]
    }
}
```


Cisco DNA Center and Cisco ISE Integration

Cisco ISE has three use cases with Cisco DNA Center:

1. Cisco ISE can be used as a AAA (pronounced "triple A") server for user, device, and client authentication. If you are not using access control policies, or are not using Cisco ISE as a AAA server for device authentication, you do not have to install and configure Cisco ISE.
2. Access control policies use Cisco ISE to enforce access control. Before you create and use access control policies, integrate Cisco DNA Center and Cisco ISE. The process involves installing and configuring Cisco ISE with specific services, and configuring Cisco ISE settings in Cisco DNA Center. For more information about installing and configuring Cisco ISE with Cisco DNA Center, see the Cisco DNA Center Installation Guide.

3. If your network uses Cisco ISE for user authentication, configure Assurance for Cisco ISE integration. This integration lets you see more information about wired clients, such as the username and operating system, in Assurance. For more information, see "About Cisco ISE Configuration for Cisco DNA Center" in the Cisco DNA Assurance User Guide.

After Cisco ISE is successfully registered and its trust established with Cisco DNA Center, Cisco DNA Center shares information with Cisco ISE. Cisco DNA Center devices that are assigned to a site that is configured with Cisco ISE as its AAA server have their inventory data propagated to Cisco ISE. Additionally, any updates on these Cisco DNA Center devices (for example, device credentials) in Cisco DNA Center also updates Cisco ISE with the changes.

If a Cisco DNA Center device associated to a site with Cisco ISE as its AAA server is not propagated to Cisco ISE as expected, Cisco DNA Center automatically retries after waiting for a specific time interval. This subsequent attempt occurs when the initial Cisco DNA Center device push to Cisco ISE fails due to any networking issue, Cisco ISE downtime, or any other auto correctable errors. Cisco DNA Center attempts to establish eventual consistency with Cisco ISE by retrying to add the device or update its data to Cisco ISE. However, a retry is not attempted if the failure to propagate the device or device data to Cisco ISE is due to a rejection from Cisco ISE itself, as an input validation error.

If you change the RADIUS shared secret for Cisco ISE, Cisco ISE does not update Cisco DNA Center with the changes. To update the shared secret in Cisco DNA Center to match Cisco ISE, edit the AAA server with the new password. Cisco DNA Center downloads the new certificate from Cisco ISE, and updates Cisco DNA Center.

Cisco ISE does not share existing device information with Cisco DNA Center. The only way for Cisco DNA Center to know about the devices in Cisco ISE is if the devices have the same name in Cisco DNA Center; Cisco DNA Center and Cisco ISE uniquely identify devices for this integration through the device's hostname variable.

Note The process that propagates Cisco DNA Center inventory devices to Cisco ISE and updates the changes to it are all captured in the Cisco DNA Center audit logs. If there are any issues in the Cisco DNA Center-to-Cisco ISE workflow, view the audit logs in the Cisco DNA Center GUI for information.

Cisco DNA Center integrates with the primary Administration ISE node. When you access Cisco ISE from Cisco DNA Center, you connect with this node.

Cisco DNA Center polls Cisco ISE every 15 minutes. If the Cisco ISE server is down, Cisco DNA Center shows the Cisco ISE server as red (unreachable).

When the Cisco ISE server is unreachable, Cisco DNA Center increases polling to 15 seconds, and then doubles the polling time to 30 seconds, 1 minute, 2 minutes, 4 minutes, and so on, until it reaches the maximum polling time of 15 minutes. Cisco DNA Center continues to poll every 15 minutes for 3 days. If Cisco DNA Center does not regain connectivity, it stops polling and updates the Cisco ISE server status to **Untrusted**. If this happens, you must reestablish trust between Cisco DNA Center and the Cisco ISE server.

Review the following additional requirements and recommendations to verify Cisco DNA Center and Cisco ISE integration:

- Cisco DNA Center and Cisco ISE integration is not supported over a proxy server. If you have Cisco ISE configured with a proxy server in your network, configure Cisco DNA Center such that it does not use the proxy server; it can do this by bypassing the proxy server's IP address.

- Cisco DNA Center and Cisco ISE integration is not supported through a Cisco DNA Center virtual IP address (VIP). If you are using an enterprise CA-issued certificate for Cisco DNA Center, make sure the Cisco DNA Center certificate includes the IP addresses of all interfaces on Cisco DNA Center in the Subject Alternative Name (SAN) extension. If Cisco DNA Center is a three-node cluster, the IP addresses of all interfaces from all three nodes must be included in the SAN extension of the Cisco DNA Center certificate.
- You must have Admin-level access in Cisco ISE.
- Disable password expiry for the Admin user in Cisco ISE. Alternatively, make sure that you update the password before it expires. For more information, see the Cisco Identity Services Engine Administrator Guide.
- When the Cisco ISE certificate changes, Cisco DNA Center must be updated. To do that, edit the AAA server (Cisco ISE), reenter the password, and save. This forces Cisco DNA Center to download the certificate chain for the new admin certificate from Cisco ISE, and update Cisco DNA Center. If you are using Cisco ISE in HA mode, and the admin certificate changes on either the primary or secondary administrative node, you must update Cisco DNA Center.
- Cisco DNA Center configures certificates for itself and for Cisco ISE to connect over pxGrid. You can use other certificates with pxGrid for connections to other pxGrid clients, such as Firepower. These other connections do not interfere with the Cisco DNA Center and Cisco ISE pxGrid connection.
- You can change the RADIUS secret password. You provided the secret password when you configured Cisco ISE as a AAA server under **System** > **Settings** > **External Services** > **Authentication and Policy Servers**. To change the secret password, choose **Design** > **Network Settings** > **Network** and click the **Change Shared Secret** link. This causes Cisco ISE to use the new secret password when connecting to network devices managed by Cisco DNA Center.
- In distributed Cisco ISE clusters, each node performs only certain functions, such as PAN (Admin), MnT (Monitoring and Troubleshooting), or PSN (Policy Service). It is possible to have only Admin certificate usage on PAN nodes, and only EAP Authentication certificate usage on PSN nodes. However, this configuration prevents Cisco DNA Center and Cisco ISE integration for pxGrid. Therefore, we recommend that you enable EAP Authentication certificate usage on the Cisco ISE primary PAN node.
- Cisco DNA Center supports certificate revocation checks via CRL Distribution Point (CDP) and Online Certificate Status Protocol (OCSP). During integration, Cisco DNA Center receives the Cisco ISE admin certificate over port 9060 and verifies its validity based on the CDP and OCSP URLs inside that Cisco ISE admin certificate. If both CDP (which contains a list of CRLs) and OCSP are configured, Cisco DNA Center uses OCSP to verify the revocation status of the certificate and falls back to CDP if the OCSP URL is not accessible. If there are multiple CRLs present in CDP, Cisco DNA Center contacts the next CRL if the first CRL is not reachable. However, due to a JDK PKI Oracle bug, the system does not check for all CRL entries.

  Proxy is not supported for certificate verification. Cisco DNA Center contacts the CRL and OCSP servers without proxy.

  - OCSP and CRL entries are optional in the certificate.
  - LDAP is not supported as a protocol for certificate validation. Do not include LDAP URLs in CDP or AIA extensions.
  - All URLs in CDP and OCSP must be reachable from Cisco DNA Center. Unreachable URLs can cause a poor integration experience, including a failed integration.

Anonymize Data

Cisco DNA Center allows you to anonymize wired and wireless endpoints data. You can scramble personally identifiable data, such as the user ID and device hostname of wired and wireless endpoints.

Make sure that you enable anonymization before you run Discovery. If you anonymize the data after you run Discovery, the new data coming into the system is anonymized, but the existing data is not anonymized.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **Anonymize Data**.
The Anonymize Data window is displayed.

Step 2 Check the **Enable Anonymization** check box.

Step 3 Click **Save**.
After you enable anonymization, you can only search for the device using nonanonymized information such as the MAC address, IP address, so on.

Configure Authentication and Policy Servers

Cisco DNA Center uses AAA servers for user authentication and Cisco ISE for both user authentication and access control. Use this procedure to configure AAA servers, including Cisco ISE.

Before you begin

- If you are using Cisco ISE to perform both policy and AAA functions, make sure that Cisco DNA Center and Cisco ISE are integrated.
- If you are using another product (not Cisco ISE) to perform AAA functions, make sure to do the following:
  - Register Cisco DNA Center with the AAA server, including defining the shared secret on both the AAA server and Cisco DNA Center.
  - Define an attribute name for Cisco DNA Center on the AAA server.
  - For a Cisco DNA Center multihost cluster configuration, define all individual host IP addresses and the virtual IP address for the multihost cluster on the AAA server.
- Before you configure Cisco ISE, confirm that:
  - You have deployed Cisco ISE on your network. For information on supported Cisco ISE versions, see the Cisco DNA Center Compatibility Matrix. For information on installing Cisco ISE, see the Cisco Identity Services Engine Install and Upgrade guides.
  - If you have a standalone ISE deployment, you must integrate Cisco DNA Center with the Cisco ISE node and enable the pxGrid service and External RESTful Services (ERS) on that node.

Note Although pxGrid 2.0 allows up to four pxGrid nodes in the Cisco ISE deployment, Cisco DNA Center releases earlier than 2.2.1.x do not support more than two pxGrid nodes.

- If you have a distributed Cisco ISE deployment:
  - You must integrate Cisco DNA Center with the primary policy administration node (PAN), and enable ERS on the PAN.

Note We recommend that you use ERS through the PAN. However, for backup, you can enable ERS on the PSNs.

  - You must enable the pxGrid service on one of the Cisco ISE nodes within the distributed deployment. Although you can choose to do so, you do not have to enable pxGrid on the PAN. You can enable pxGrid on any Cisco ISE node in your distributed deployment.
  - The PSNs that you configure in Cisco ISE to handle TrustSec or SD Access content and PACs must also be defined in **Work Centers** > **Trustsec** > **Trustsec Servers** > **Trustsec AAA Servers**. For more information, see the *Cisco Identity Services Engine Administrator Guide*.

- You must enable communication between Cisco DNA Center and Cisco ISE on the following ports: 443, 5222, 8910, and 9060.
- The Cisco ISE host on which pxGrid is enabled must be reachable from Cisco DNA Center on the IP address of the Cisco ISE eth0 interface.
- The Cisco ISE node can reach the fabric underlay network via the appliance's NIC.
- The Cisco ISE admin node certificate must contain the Cisco ISE IP address or FQDN in either the certificate subject name or the Subject Alternative Name (SAN).
- The Cisco DNA Center system certificate must list both the Cisco DNA Center appliance IP address and FQDN in the SAN field.

Note For Cisco ISE 2.4 Patch 13, 2.6 Patch 7, and 2.7 Patch 3, if you are using the Cisco ISE default self-signed certificate as the pxGrid certificate, Cisco ISE might reject that certificate after applying those patches. This is because the older versions of that certificate have the Netscape Cert Type extension specified as the SSL server, which now fails (because a client certificate is required).

This issue does not occur in Cisco ISE 3.0 and later. For more information, see the Cisco ISE Release Notes.

Step 1 Click the menu icon (≡) and choose **System** > **Settings** > **External Services** > **Authentication and Policy Servers**.

Step 2 From the **Add** drop-down list, choose **AAA** or **ISE**.

Step 3 To configure the primary AAA server, enter the following information:

- **Server IP Address**: IP address of the AAA server.
- **Shared Secret**: Key for device authentications. The shared secret can contain up to 100 characters.

Step 4 To configure a Cisco ISE server, enter the following details:

- **Server IP Address**: IP address of the ISE server.
- **Shared Secret**: Key for device authentications.
- **Username**: Username that is used to log in to the Cisco ISE CLI.

  Note This user must be a Super Admin.

- **Password**: Password for the Cisco ISE CLI username.
- **FQDN**: Fully qualified domain name (FQDN) of the Cisco ISE server.

  Note
  - We recommend that you copy the FQDN that is defined in Cisco ISE (**Administration** > **Deployment** > **Deployment Nodes** > **List**) and paste it directly into this field.
  - The FQDN that you enter must match the FQDN, Common Name (CN), or Subject Alternative Name (SAN) defined in the Cisco ISE certificate.

  The FQDN consists of two parts, a hostname and the domain name, in the following format:

  hostname.domainname.com

  For example, the FQDN for a Cisco ISE server can be ise.cisco.com.

- **Virtual IP Address(es)**: Virtual IP address of the load balancer behind which the Cisco ISE policy service nodes (PSNs) are located. If you have multiple PSN farms behind different load balancers, you can enter a maximum of six virtual IP addresses.

Step 5 Click **Advanced Settings** and configure the settings:

- **Connect to pxGrid**: Check this check box to enable a pxGrid connection.

  If you want to use the Cisco DNA Center system certificate as the pxGrid client certificate (sent to Cisco ISE to authenticate the Cisco DNA Center system as a pxGrid client), check the **Use Cisco DNA Center Certificate for pxGrid** check box. You can use this option if all the certificates that are used in your operating environments must be generated by the same CA. If this option is disabled, Cisco DNA Center will send a request to Cisco ISE to generate a pxGrid client certificate for the system to use.

  When you enable this option, ensure that:

  - The Cisco DNA Center certificate is generated by the same Certificate Authority (CA) as is in use by Cisco ISE (otherwise, the pxGrid authentication fails).
  - The Certificate Extended Key Use (EKU) field includes "Client Authentication."

- **Protocol**: **TACACS** and **RADIUS** (the default). You can select both protocols.

Attention If you do not enable TACAS for a Cisco ISE server here, you cannot configure the Cisco ISE server as a TACACS server under **Design** > **Network Settings** > **Network** when configuring a AAA server for network device authentication.

- **Authentication Port**: Port used to relay authentication messages to the AAA server. The default UDP port is 1812.
- **Accounting Port**: Port used to relay important events to the AAA server. The default UDP port is 1813.
- **Port**: The default TACACS port is 49.
- **Retries**: Number of times that Cisco DNA Center attempts to connect with the AAA server before abandoning the attempt to connect. The default number of attempts is 3.
- **Timeout**: The time period for which the device waits for the AAA server to respond before abandoning the attempt to connect. The default timeout is 4 seconds.

Note After the required information is provided, Cisco ISE is integrated with Cisco DNA Center in two phases. It takes several minutes for the integration to complete. The phase-wise integration status is shown in the **Authentication and Policy Servers** window and **System 360** window:

Cisco ISE server registration phase:

- **Authentication and Policy Servers** window: "In Progress"
- **System 360** window: "Primary Available"

pxGrid subscriptions registration phase:

- **Authentication and Policy Servers** window: "Active"
- **System 360** window: "Primary Available" and "pxGrid Available"

If the status of the configured Cisco ISE server is shown as "FAILED" due to a password change, click **Retry**, and update the password to resynchronize the Cisco ISE connectivity.

Step 6 Click **Add**.

Step 7 To add a secondary server, repeat the preceding steps.

Configure Cisco AI Network Analytics Data Collection

Use this procedure to enable Cisco AI Network Analytics to export network event data from network devices as well as the site hierarchy to the Cisco DNA Center.

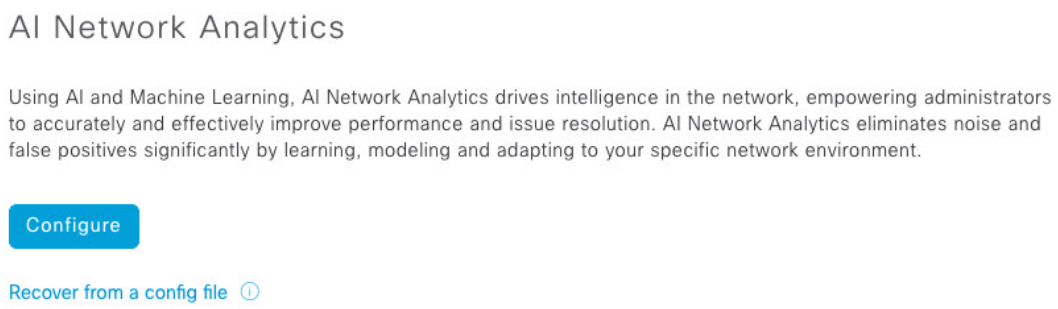
Before you begin

- Make sure that you have the Cisco DNA Advantage software license for Cisco DNA Center. The **AI Network Analytics** application is part of the Cisco DNA Advantage software license.
- Make sure that you have downloaded and installed the **AI Network Analytics** application. See Download and Install Application Updates.

- Make sure that your network or HTTP proxy is configured to allow outbound HTTPS (TCP 443) access to the following cloud hosts:
  - **api.use1.prd.kairos.ciscolabs.com** (US East Region)
  - **api.euc1.prd.kairos.ciscolabs.com** (EU Central Region)

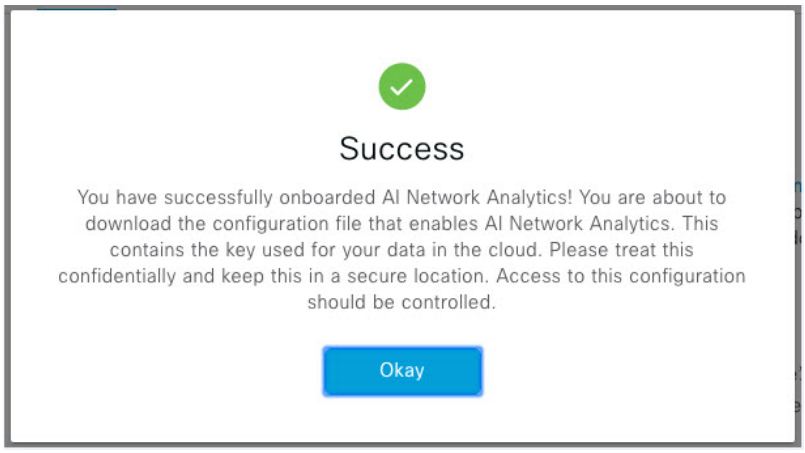
Step 1 Click the menu icon (☰) and choose **System** > **Settings**.

Step 2 Scroll down to **External Services** and choose **Cisco AI Analytics**.
The **AI Network Analytics** window appears.



Step 3 Do one of the following:

- If you have an earlier version of Cisco AI Network Analytics installed in your appliance, do the following:
  1. Click **Recover from a config file**.
     The Restore AI Network Analytics window appears.
  2. Drag-and-drop the configuration files in the area provided or choose the files from your file system.
  3. Click **Restore**.
     Cisco AI Network Analytics might take a few minutes to restore, and then the **Success** dialog box appears.
- If this is the first time you are configuring Cisco AI Network Analytics, do the following:
  1. Click **Configure**.
  2. In the **Where should we securely store your data?** area, choose the location to store your data. Options are: **Europe (Germany)** or **US East (North Virginia)**.
     The system starts testing cloud connectivity as indicated by the **Testing cloud connectivity...** tab. After cloud connectivity testing completes, the **Testing cloud connectivity...** tab changes to **Cloud connection verified**.
  3. Click **Next**.
     The terms and conditions window appears.
  4. Click the **Accept Cisco Universal Cloud Agreement** check box to agree to the terms and conditions, and then click **Enable**.
     Cisco AI Network Analytics might take a few minutes to enable, and then the **Success** dialog box appears.



Step 4 In the **Success** dialog box, click **Okay**.
The **AI Network Analytics** window appears, and the **Enable AI Network Analytics** toggle button displays .

Step 5 (Recommended) In the **AI Network Analytics** window, click **Download Configuration** file.

Disable Cisco AI Network Analytics Data Collection

To disable Cisco AI Network Analytics data collection, you must disable the AI Network Analytics feature, as follows:

Step 1 Click the menu icon ( ) and choose **System** > **Settings**.

Step 2 Scroll down to **External Services** and choose **Cisco AI Analytics**.
For each feature, a check mark ( ) indicates that the feature is enabled. If the check box is unchecked ( ), the feature is disabled.

Step 3 In the **AI Network Analytics** area, click the **Enable AI Network Analytics** toggle button so that it is unchecked ( ).

Step 4 Click **Update**.

Step 5 To delete your network data from the Cisco AI Network Analytics cloud, contact the Cisco Technical Response Center (TAC) and open a support request.

Step 6 (Optional) If you have misplaced your previous configuration, click **Download configuration file**.

Update the Machine Reasoning Knowledge Base

Machine Reasoning knowledge packs are step-by-step workflows that are used by the Machine Reasoning Engine (MRE) to identify security issues and improve automated root cause analysis. These knowledge packs are continuously updated as more information is received. The Machine Reasoning Knowledge Base is a repository of these knowledge packs (workflows). To have access to the latest knowledge packs, you can

either configure Cisco DNA Center to automatically update the Machine Reasoning Knowledge Base on a daily basis, or you can perform a manual update.

Step 1 Click the menu icon (☰) and choose **System** > **Settings**.

Step 2 Scroll down to **External Services** and choose **Machine Reasoning Knowledge Base**.
The **Machine Reasoning Knowledge Base** window shows the following information:

- **INSTALLED**: Shows the installed version and installation date of the Machine Reasoning Knowledge Base package.

When there is a new update to the Machine Reasoning Knowledge Base, the **AVAILABLE UPDATE** area appears in the **Machine Reasoning Knowledge Base** window, which provides the **Version** and **Details** about the update.

- **AUTO UPDATE**: Automatically updates the Machine Reasoning Knowledge Base in Cisco DNA Center on a daily basis.
- **CISCO CX CLOUD SERVICE FOR NETWORK BUG IDENTIFIER AND SECURITY ADVISORY**: Integrates Cisco DNA Center with CX Cloud that allows you to perform an automated config. This integration provides enhanced vulnerability detection on devices directly from security advisories tool on Cisco DNA Center.

Step 3 (Recommended) Check the **AUTO UPDATE** check box to automatically update the Machine Reasoning Knowledge Base.
The **Next Attempt** area shows the date and time of the next update.

You can perform an automatic update only if Cisco DNA Center is successfully connected to the Machine Reasoning Engine in the cloud.

Step 4 To manually update the Machine Reasoning Knowledge Base in Cisco DNA Center, do one of the following:

- Under **AVAILABLE UPDATES**, click **Update**. A **Success** pop-up window appears with the status of the update.
- Manually download the Machine Reason Knowledge Base to your local machine and import it to Cisco DNA Center. Do the following:

  a. Click **Download**.

  The **Opening mre_workflow_signed** dialog box appears.

  b. Open or save the downloaded file to the desired location in your local machine, and then click **OK**.

  c. Click **Import** to import the downloaded Machine Reasoning Knowledge Base from your local machine to Cisco DNA Center.

Step 5 Check the **CISCO CX CLOUD SERVICE FOR NETWORK BUG IDENTIFIER AND SECURITY ADVISORY** check box to enable Cisco CX Cloud connection with network bug identifier and security advisory.

Step 6 In the **Security Advisories Settings** area click the **RECURRING SCAN** toggle button to enable or disable the weekly recurring scan.

Step 7 Click the **CISCO CX CLOUD** toggle button to enable or disable the Cisco CX cloud.

Cisco Accounts

Configure Cisco Credentials

You can configure Cisco credentials for Cisco DNA Center. Cisco credentials are the username and password that you use to log in to the Cisco website to access software and services.

Note The Cisco credentials configured for Cisco DNA Center using this procedure are used for software image and update downloads. The Cisco credentials are also encrypted by this process for security purposes.

Before you begin

Only a user with SUPER-ADMIN-ROLE permissions can perform this procedure. For more information, see About User Roles.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Cisco Accounts** > **Cisco.com Credentials**.

Step 2 Enter your Cisco username and password.

Step 3 Click **Save**.

Your cisco.com credentials are configured for the software and services.

Clear Cisco Credentials

To delete the cisco.com credentials that are currently configured for Cisco DNA Center, complete the following procedure.

Note

- When you perform any tasks that involve software downloads or device provisioning and cisco.com credentials are not configured, you will be prompted to enter them before you can proceed. In the resulting dialog box, check the **Save For Later** check box in order to save these credentials for use throughout Cisco DNA Center. Otherwise, you will need to enter credentials each time you perform these tasks.
- Completing this procedure will undo your acceptance of the end-user license agreement (EULA). See Accept the License Agreement, on page 55 for a description of how to re-enter EULA acceptance.

Before you begin

Only a user with SUPER-ADMIN-ROLE permissions can perform this procedure. For more information, see About User Roles.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Cisco Accounts** > **Cisco.com Credentials**.

Step 2 Click **Clear**.

Step 3 In the resulting dialog box, click **Continue** to confirm the operation.

Configure Connection Mode

Connection mode manages the connections between smart-enabled devices in your network that interact with Cisco DNA Center and the Cisco Smart Software Manager (SSM). Ensure that you have SUPER-ADMIN access permission to configure the different connection modes.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Cisco Accounts** > **SSM Connection Mode**.

The following connection modes are available:

- **Direct**
- **On-Prem CSSM**
- **Smart proxy**

Step 2 Choose **Direct** to enable a direct connection to the Cisco SSM cloud.

Step 3 If your organization is security sensitive, choose **On-Prem CSSM**. The on-prem option lets you access a subset of Cisco SSM functionality without using a direct internet connection to manage your licenses with the Cisco SSM cloud.

a) Before you enable **On-Prem CSSM**, confirm that the satellite is deployed, up, and running in your network site.

If the satellite is configured with FQDN, the call-home configuration of satellite FQDN is pushed instead of the IP address.

b) Enter the details for the **On-Prem CSSM Host**, **Smart Account Name**, **Client ID**, and **Client Secret**.
For information about how to retrieve the client ID and client secret, see the Cisco Smart Software Manager On-Prem User Guide.

c) Click **Test Connection** to validate the Cisco SSM connection.

d) Click **Save** and then **Confirm**.

e) If there are devices that need to be registered again with the changed SSM, the **Need to Re-Register Devices** dialog box appears. Click **OK** in the dialog box.

f) In the **Tools** > **License Manager** > **Devices** window, choose the devices that you want to register again and click **Finish Connection Mode Changes**.

g) In the **Resync Devices** dialog box, do the following:

- Enter the **Smart Account**.
- Enter the **Virtual Account**.
- Click **Now** to start the resync immediately or click **Later** to schedule the resync at a specific time.
- Click **Resync**.

The **Recent Tasks** window shows the resync status of the devices.

Step 4 Choose **Smart proxy** to register your smart-enabled devices with the Cisco SSM cloud through Cisco DNA Center. With this mode, devices do not need a direct connection to the Cisco SSM cloud. Cisco DNA Center proxies the requests from the device to the Cisco SSM cloud through itself.

While provisioning the call-home configuration to the device, if the satellite is configured with FQDN, the FQDN of the satellite is pushed instead of the IP address.

Register Plug and Play

You can register Cisco DNA Center as a controller for Cisco Plug and Play (PnP) Connect, in a Cisco Smart Account for redirection services. This lets you synchronize the device inventory from the Cisco PnP Connect cloud portal to PnP in Cisco DNA Center.

Before you begin

Only a user with **SUPER-ADMIN-ROLE** or **CUSTOM-ROLE** with system management permissions can perform this procedure.

In the Smart account, users are assigned roles that specify the functions and authorized to perform:

- Smart Account Admin user can access all the Virtual Accounts.
- Users can access assigned Virtual Accounts only.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Cisco Accounts** > **PnP Connect**.
A table of PnP connected profiles is displayed.

Step 2 Click **Register** to register a virtual account.

Step 3 In the **Register Virtual Account** window, the Smart Account you configured is displayed in the **Select Smart Account** drop-down list. You can select account from the **Select Virtual Account** drop-down list.

Step 4 Click the required **Controller** radio button.

Step 5 Enter the IP address or FQDN (Fully Qualified Domain Name).

Step 6 Enter the profile name. A profile is created for the selected virtual account with the configuration you provided.

Step 7 Click **Save**.

Create PnP Event Notifications

You receive a notification whenever a Plug and Play (PnP) event takes place in Cisco DNA Center by creating event notifications. See the Cisco DNA Center Platform User Guide's "Work with Event Notifications" topic to configure the supported channels and create event notifications.

Ensure that you create event notifications to the following PnP events:

Event Name	Event ID	Description
Add device failed	NETWORK-TASK_FAILURE-3-008	Device(s) are not added through single or bulk import. An error occurs when adding devices through single or bulk import.

Event Name	Event ID	Description
Add device successful	NETWORK-TASK_COMPLETE-4-007	Device(s) are added through single or bulk import successfully.
Device in error state	NETWORK-ERROR_1-002	Device goes to **Error** state.
Device in provisioned state	NETWORK-INFO_4-003	Device goes to **Provisioned** state.
Device stuck in onboarding state	NETWORK-TASK_PROGRESS-2-006	Device is stuck in onboarding state for more than 15 minutes.
Device waiting to be claimed	NETWORK-INFO_2-001	Device reaches **Unclaimed** state and is ready to be provisioned.
Smart Account sync failed	NETWORK-TASK_FAILURE-1-005	Smart Account sync is failed for some devices.
Smart Account sync successful	NETWORK-TASK_COMPLETE-4-004	Smart Account sync is successful for some devices.

Configure Smart Account

Cisco Smart Account credentials are used for connecting to your Smart Licensing account. The License Manager tool uses the details of license information from this Smart Account for entitlement and license management.

Before you begin

Ensure that you have SUPER-ADMIN-ROLE permissions.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Cisco Accounts** > **Smart Account**.

Step 2 Click the **Add** button. You are prompted to provide Smart Account credentials.

a) Enter your Smart Account username and password.
b) Click **Save**. Your Smart Account is configured.

Step 3 If you want to change the selected Smart Account Name, click **Change**. You will be prompted to Select the Smart Account that will be used for connecting to your Smart Licensing Account on Cisco SSM cloud.

a) Choose the **Smart Account** from the drop-down list.
b) Click **Save**.

Step 4 Click **View all virtual accounts** to view all the virtual accounts associated with the Smart Account.

Note Cisco Accounts supports multiple smart and virtual accounts.

Step 5 (Optional) If you want to register smart license-enabled devices automatically to a virtual account, check the **Auto register smart license enabled devices** check box. A list of virtual accounts associated with the smart account is displayed.

Step 6 Select the required virtual account. Whenever a smart license-enabled device is added in the inventory, it will be automatically registered to the selected virtual account.

Smart Licensing

Cisco Smart Licensing is a flexible licensing model that provides you with an easier, faster, and more consistent way to purchase and manage software across the Cisco portfolio and across your organization. And it's secure—you control what users can access. With Smart Licensing, you get:

- **Easy Activation**: Smart Licensing establishes a pool of software licenses that can be used across the entire organization—no more product activation keys (PAKs).
- **Unified Management**: My Cisco Entitlements (MCE) provides a complete view into all of your Cisco products and services in an easy-to-use portal, so you always know what you have and what you are using.
- **License Flexibility**: Your software is not node-locked to your hardware, so you can easily use and transfer licenses as needed.

To use Smart Licensing, you must first set up a Smart Account on Cisco Software Central (software.cisco.com).

For a more detailed overview on Cisco licensing, go to cisco.com/go/licensingguide.

Before you begin

- To enable Smart Licensing, you must configure Cisco Credentials (see Configure Cisco Credentials, on page 48) and upload Cisco DNA Center license conventions in Cisco SSM.
- Smart Licensing is not supported when the **System** > **Settings** > **Cisco Accounts** > **SSM Connection Mode** is **On-Prem CSSM**.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Cisco Accounts** > **Smart Licensing**.

By default, **Smart User** and **Smart Domain** details are displayed.

Step 2 Choose a virtual account from the **Search Virtual Account** drop-down list to register.

Step 3 Click **Register**.

Step 4 After successful registration, click the **View Available Licenses** link to view the available Cisco DNA Center licenses.

Device Controllability

Device controllability is a system-level process on Cisco DNA Center that enforces state synchronization for some device-layer features. Its purpose is to aid in the deployment of network settings that Cisco DNA Center needs to manage devices. Changes are made on network devices when running discovery, when adding a device to inventory, or when assigning a device to a site.

To view the configuration that is pushed to the device, go to **Provision** > **Inventory** and from the **Focus** drop-down list, choose **Provision**. In the **Provision Status** column, click **See Details**.

Note When Cisco DNA Center configures or updates devices, the transactions are captured in the audit logs, which you can use to track changes and troubleshoot issues.

The following device settings are enabled as part of device controllability:

- **Device Discovery**
  - SNMP Credentials
  - NETCONF Credentials
- **Adding Devices to Inventory**

  Cisco TrustSec (CTS) Credentials

Note Cisco TrustSec (CTS) Credentials are pushed during inventory only if the **Global** site is configured with Cisco ISE as AAA. Otherwise, CTS is pushed to devices during "Assign to Site" when the site is configured with Cisco ISE as AAA.

- **Assigning Devices to a Site**
  - Controller Certificates
  - SNMP Trap Server Definitions
  - Syslog Server Definitions
  - NetFlow Server Definitions
  - Wireless Service Assurance (WSA)
  - IPDT Enablement

Device controllability is enabled by default. If you do not want device controllability enabled, disable it manually. For more information, see Configure Device Controllability, on page 54.

When device controllability is disabled, Cisco DNA Center does not configure any of the preceding credentials or features on devices while running discovery or when the devices are assigned to a site. However, the telemetry settings and related configuration are pushed when the device is provisioned or when the **Update Telemetry Settings** action is performed from **Provision** > **Inventory** > **Actions**. At the time of the network settings creation on the site, if device controllability is enabled, the associated devices are configured accordingly.

The following circumstances dictate whether or not device controllability configures network settings on devices:

- **Device Discovery**: If SNMP and NETCONF credentials are not already present on a device, these settings are configured during the discovery process.
- **Device in Inventory**: After a successful initial inventory collection, IPDT is configured on the devices.

  In earlier releases, the following IPDT commands were configured:

```
ip device tracking
ip device tracking probe delay 60
ip device tracking probe use-svi
```

For each interface:

```
interface $physicalInterface
ip device tracking maximum 65535
```

In the current release, the following IPDT commands are configured for any newly discovered device:

```
device-tracking tracking
device-tracking policy IPDT_POLICY
tracking enable
```

For each interface:

```
interface $physicalInterface
device-tracking attach-policy IPDT_POLICY
```

- **Device in Global Site**: When you successfully add, import, or discover a device, Cisco DNA Center places the device in the **Managed** state and assigns it to the **Global** site by default. Even if you have defined SNMP server, Syslog server, and NetFlow collector settings for the **Global** site, Cisco DNA Center *does not* change these settings on the device.
- **Device Moved to Site**: If you move a device from the **Global** site to a new site that has SNMP server, Syslog server, and NetFlow collector settings configured, Cisco DNA Center changes these settings on the device to the settings configured for the new site.
- **Device Removed from Site**: If you remove a device from a site, Cisco DNA Center does not remove the SNMP server, Syslog server, and NetFlow collector settings from the device.
- **Device Deleted from Cisco DNA Center**: If you delete a device from Cisco DNA Center and check the **Configuration Clean-up** check box, the SNMP server, Syslog server, and NetFlow collector settings are removed from the device.
- **Device Moved from Site to Site**: If you move a device—for example, from Site A to Site B—Cisco DNA Center replaces the SNMP server, Syslog server, and NetFlow collector settings on the device with the settings assigned to Site B.
- **Update Site Telemetry Changes**: The changes made to any settings that are under the scope of device controllability are applied to the network devices during device provisioning or when the **Update Telemetry Settings** action is performed, even if device controllability is not enabled.

Configure Device Controllability

Device controllability aids deployment of the required network settings that Cisco DNA Center needs to manage devices.

Note If you disable device controllability, none of the credentials or features described in the **Device Controllability** page will be configured on the devices during discovery or at runtime.

Device controllability is enabled by default. To manually disable device controllability, do the following:

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Device Settings** > **Device Controllability**.

Step 2 Uncheck the **Enable Device Controllability** check box.

Step 3 Click **Save**.

Accept the License Agreement

You must accept the end-user license agreement (EULA) before downloading software or provisioning a device.

Note If you have not yet configured cisco.com credentials, you are prompted to configure them in the **Device EULA Acceptance** window before proceeding.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Device Settings** > **Device EULA Acceptance**.

Step 2 Click the **Cisco End User License Agreement** link and read the EULA.

Step 3 Check the **I have read and accept the Device EULA** check box.

Step 4 Click **Save**.

Configure SNMP Properties

You can configure retry and timeout values for SNMP.

Before you begin

Only a user with SUPER-ADMIN-ROLE permissions can perform this procedure. For more information, see About User Roles.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Device Settings** > **SNMP**.

Step 2 Configure the following fields:

- **Retries**: Number of attempts allowed to connect to the device. Valid values are from 1 to 3. The default is 3.
- **Timeout**: Number of seconds Cisco DNA Center waits when trying to establish a connection with a device before timing out. Valid values are from 1 to 300 seconds in intervals of 5 seconds. The default is 5 seconds.

Step 3 Click **Save**.

Step 4 (Optional) To return to the default settings, click **Reset** and **Save**.

Enable ICMP Ping

When Internet Control Message Protocol (ICMP) ping is enabled and there are unreachable access points in FlexConnect mode, Cisco DNA Center uses ICMP to ping those access points every 5 minutes to enhance reachability.

The following procedure describes how to enable an ICMP ping.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Device Settings** > **ICMP Ping**.

Step 2 Check the **Enable ICMP ping for unreachable access points in FlexConnect mode** check box.

Step 3 Click **Save**.

Configure an Image Distribution Server

An image distribution server helps in storage and distribution of software images. You can configure an external image distribution server to distribute software images. You can also set up one or more protocols for newly added image distribution server.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Device Settings**.

Step 2 From the **Device Settings** drop-down list, choose **Image Distribution Servers**.

Step 3 In the **Image Distribution Servers** window, click **Servers**.

The **Image Distribution Servers** table displays details of host, username, SFTP, SCP, and connectivity of image distribution servers.

Step 4 Click **Add** to add a new image distribution server.

The **Add a New Image Distribution Server** slide-in pane appears.

Step 5 Configure the following image distribution server settings:

- **Host**: Enter the hostname or IP address of the image distribution server.
- **Root Location**: Check the **Use root directory for file transfers** check box to use the root directory for file transfers, or uncheck the **Use root directory for file transfers** check box and enter the root location.

  Note For Cisco AireOS Controllers, image distribution fails if the configured path is more than 16 characters.
- Expand the **SFTP and SCP** area.
- **Username**: Enter username to log in to the image distribution server. The username have read/write privileges in the working root directory of the server.
- **Password**: Password that is used to log in to the image distribution server.
- **Port Number**: Enter the port number on which the image distribution server is running.

Step 6 Click **Save**.

Step 7 Because some legacy wireless controller software versions support only weak ciphers (such as SHA1-based ciphers) for SFTP, Cisco DNA Center should enable SFTP compatibility mode for SFTP connections from wireless controllers for software image management and wireless assurance. You can temporarily enable support for weak ciphers on the Cisco DNA Center SFTP server for up to 90 days. To allow weak ciphers:

a) Hover over the **i** icon next to the IP address of the SFTP server and click **Click here**.

b) In the **Compatibility Mode** slide-in pane, check the **Compatibility Mode** check box and enter a duration (from 1 minute to 90 days).

c) Click **Save**.

Step 8 (Optional) To edit the settings, click the **Edit** icon adjacent to the corresponding image distribution server in the **Action** column, make the required changes in the **Edit** window, and click **Save**.

Step 9 (Optional) To delete an image distribution server, click the **Delete** icon adjacent to the corresponding image distribution server in the **Action** column and click **Delete**.

Enable PNP Device Authorization

The following procedure describes how to enable authorization on the device.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Device Settings**.

Step 2 From the **Device Settings** drop-down list, choose **PNP Device Authorization**.

Note By default, devices are automatically authorized.

Step 3 Check the **Device Authorization** check box to enable authorization on the device.

Step 4 Click **Save**.

Configure Device Prompts

Cisco DNA Center allows you to create custom prompts for the username and password. You can configure the devices in your network to use custom prompts and collect information about the devices.

Create Custom Prompts

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Device Settings** > **Device Prompts**.

The **Device Prompts** window appears.

Step 2 Click **Create Custom Prompt**.

The **Create Custom Prompt** slide-in pane appears.

Step 3 To create custom prompts for the username, do the following:

a. From the **Prompt Type** drop-down list, choose **username**.

b. In the **Prompt Text** field, enter the text in Regular Expression (Regex).

c. Click **Save**.

Step 4 To create custom prompts for the password, do the following:

a. From the **Prompt Type** drop-down list, choose **password**.

b. In the **Prompt Text** field, enter the text in Regular Expression (Regex).

c. Click **Save**.

Note The custom prompts appear in the **Device Prompts** window. You can create up to eight custom prompts for the username and password.

Step 5 Drag and drop the custom prompts in the order that you want.

Note Cisco DNA Center maintains the custom prompts order and passes the prompts to the devices as comma-separated values. The custom prompt in the top order gets higher priority.

Step 6 Click the edit icon to edit a custom prompt.

Step 7 Click the delete icon to delete a custom prompt.

Note Username prompts and password prompts must have unique Regex. Creating the same or similar Regex causes authentication issues with the devices.

Configure Device Configuration Backup Settings

Cisco DNA Center performs periodical backup of your device running configuration. You can choose the day and time for the backup and the total number of config drifts that can be saved per device.

Note By default, the configuration backup is scheduled every Sunday 11:30 p.m. (UTC Time Zone).

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Configuration Archive**.

Step 2 In the **Configuration Archive** window, click the **Internal** tab.

Step 3 Click the **Number of config drift per device** drop-down list and choose the number of config drifts to be saved per device.

The number of config drifts that can be saved for a device ranges from 7 to 50. The total config drifts being saved includes all the labelled configs for the device.

Note By default, the number of config drifts to be saved per device is 15.

Step 4 Choose the backup day and time.

The selected backup date and time will be based on the timezone of the Cisco DNA Center cluster deployed for your network.

Step 5 Click **Save**.

Once the backup is scheduled, it can be noticed in activity center.

Step 6 Click the **External** tab to configure external server for archiving device configuration. For more information, see Configure External Server for Archiving Device Configuration, on page 59.

Configure External Server for Archiving Device Configuration

You can configure an external SFTP server for archiving the running configuration of devices.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Configuration Archive**.

Step 2 In the **Configuration Archive** window, click the **External** tab.

Step 3 Click **Add** to add an **External Repository**.

Note Only one SFTP server can be added.

Step 4 In the **Add New External Repository** slide-in pane, complete the following details:

a) **Host**: Enter the host IP address.

b) **Root Location**: Enter location of root folder.

c) **Server Protocol**: Enter the username, password, and port number of the SFTP server.

d) Choose the **Backup Format**:

- **RAW**: Full running configuration will be disclosed. All sensitive/private configuration are unmasked in the backup data. Enter password to lock the backup file.

  Note File passwords will not be saved on Cisco DNA Center, you must remember the password to access the files on the SFTP server.

- **Sanitized (Masked)**: The sensitive/private configuration details in the running configuration will be masked.

  Password is applicable only when backup format is selected as RAW.

e) Schedule the backup cycle.

Enter the backup date, time, time-zone, and backup recurrence interval.

Step 5 Click Save.

Step 6 To edit the SFTP server details, click on edit button under **Action** column.

Step 7 To remove the SFTP server, click on delete button under **Action** column.

Cloud Access Keys

You can register cloud access keys after installing the Cloud Device Provisioning Application package in Cisco DNA Center. The system supports multiple cloud access keys. Each key is used as a separate cloud profile that contains all the AWS infrastructure constructs or resources that are discovered by using that cloud access key. After a cloud access key is added, AWS VPC inventory collection is triggered automatically for it. The AWS infrastructure constructs resources that get discovered by VPC inventory collection for that cloud access key that can then be viewed and used for cloud provisioning of CSRs and WLCs.

Before you begin

- Obtain the access key ID and secret key from the Amazon Web Services (AWS) console.
- Subscribe to CSR or WLC products in the AWS marketplace and verify the image ID for the target region.
- Identify the key pair that CSRs will use during HA failover on AWS. The key pair's name is selected from a list in Cisco DNA Center when provisioning CSRs in that region.
- Identify the IAM role that CSRs will use during HA failover on AWS. The IAM role is selected from a list in Cisco DNA Center when provisioning CSRs.
- Configure the proxy for Cisco DNA Center to communicate with AWS via HTTPS REST APIs. See Configure the Proxy, on page 70.
- The Cloud Connect extension to the eNFV app is enabled by deploying a separate Cloud Device Provisioning Application package. The package is not included by default in the standard Cisco DNA Center installation. You must download and install the package from a catalog server. For more information, see Download and Install Application Updates.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Cloud Access Keys**.

Step 2 Click **Add**.

Step 3 Enter the **Access Key Name** and choose the **Cloud Platform** from the drop-down list. Enter the **Access Key ID** and **Secret Key** obtained from the AWS console.

Step 4 Click **Save and Discover**.

What to do next

- After a cloud access key is added, AWS VPC inventory collection is triggered automatically for it. It takes several minutes to synchronize with the cloud platform. Inventory collection is scheduled to occur at the default interval.
- After successful cloud inventory collection, the **Cloud** tab in the **Provision** section provides a view of the collected AWS VPC inventory.

Integrity Verification

Integrity Verification (IV) monitors key device data for unexpected changes or invalid values that indicate possible compromise, if any, of the device. The objective is to minimize the impact of a compromise by substantially reducing the time to detect unauthorized changes to a Cisco device.

Note For this release, IV runs integrity verification checks on software images that are uploaded into Cisco DNA Center. To run these checks, the IV service needs the Known Good Value (KGV) file to be uploaded.

Upload the KGV File

To provide security integrity, Cisco devices must be verified as running authentic and valid software. Currently, Cisco devices have no point of reference to determine whether they are running authentic Cisco software. IV uses a system to compare the collected image integrity data with the KGV for Cisco software.

Cisco produces and publishes a KGV data file that contains KGVs for many of its products. This KGV file is in standard JSON format, is signed by Cisco, and is bundled with other files into a single KGV file that can be retrieved from the Cisco website. The KGV file is posted at:

https://tools.cisco.com/cscrdr/security/center/files/trust/Cisco_KnownGoodValues.tar

The KGV file is imported into IV and used to verify integrity measurements obtained from the network devices.

Note Device integrity measurements are made available to and used entirely within the IV. Connectivity between IV and cisco.com is not required. The KGV file can be air-gap transferred into a protected environment and loaded into the IV.

Before you begin

Only a user with SUPER-ADMIN-ROLE permissions can perform this procedure. For more information, see About User Roles.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **External Services** > **Integrity Verification**.

Step 2 Review the current KGV file information:

- **File Name**: Name of the KGV tar file.
- **Imported By**: Cisco DNA Center user who imported the KGV file. If it is automatically downloaded, the value is **System**.
- **Imported Time**: Time at which the KGV file is imported.
- **Imported Mode**: Local or remote import mode.
- **Records**: Records processed.

- **File Hash**: File hash for the KGV file.
- **Published**: Publication date of the KGV file.

Step 3 To import the KGV file, perform one of the following steps:

- Click **Import New from Local** to import a KGV file locally.
- Click **Import Latest from Cisco** to import a KGV file from cisco.com.

Note The **Import Latest from Cisco** option does not require a firewall setup. However, if a firewall is already set up, only the connections to https://tools.cisco.com must be open.

Step 4 If you clicked **Import Latest from Cisco**, a connection is made to cisco.com and the latest KGV file is automatically imported to Cisco DNA Center.

Note A secure connection to https://tools.cisco.com is made using the certificates added to Cisco DNA Center and its proxy (if one was configured during the first-time setup).

Step 5 If you clicked **Import New from Local**, the **Import KGV** window appears.

Step 6 Perform one of the following procedures to import locally:

- Drag and drop a local KGV file into the **Import KGV** field.
- Click **Click here to select a KGV file from your computer** to select a KGV file from a folder on your computer.
- Click the **Latest KGV file** link and download the latest KGV file before dragging and dropping it into the **Import KGV** field.

Step 7 Click **Import**.

The KGV file is imported into Cisco DNA Center.

Step 8 After the import is finished, verify the current KGV file information in the UI to ensure that it has been updated.

IV automatically downloads the latest KGV file from cisco.com to your system 7 days after Cisco DNA Center is deployed. The auto downloads continue every 7 days. You can also download the KGV file manually to your local system and then import it to Cisco DNA Center. For example, if a new KGV file is available on a Friday and the auto download is every 7 days (on a Monday), you can download it manually.

The following KGV auto download information is displayed:

- **Frequency**: The frequency of the auto download.
- **Last Attempt**: The last time the KGV scheduler was triggered.
- **Status**: The status of the KGV scheduler's last attempt.
- **Message**: A status message.

What to do next

After importing the latest KGV file, choose **Design** > **Image Repository** to view the integrity of the imported images.

Note The effect of importing a KGV file can be seen in the **Image Repository** window, if the images that are already imported have an Unable to verify status (physical or virtual). Additionally, future image imports, if any, will also refer to the newly uploaded KGV for verification.

Configure an IP Address Manager

You can configure Cisco DNA Center to communicate with an external IP address manager (IPAM). When you use Cisco DNA Center to create, reserve, or delete any IP address pool, Cisco DNA Center conveys this information to your external IPAM.

Before you begin

- You should have an external IP address manager already set up and functional.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **External Services** > **IP Address Manager**.

Step 2 In the **Server Name** field, enter the name of the IPAM server.

Step 3 In the **Server URL** field, enter the URL or IP address of the IPAM server.

A warning icon and message appear, indicating that the certificate is not trusted for this server. To import the trust certificate directly from the IPAM, follow these steps:

a) Click the warning icon.

A **Certificate Warning** dialog box appears.

b) Verify the issuer, serial number, and validity dates for the certificate.

c) If the information is correct, click the check box to allow Cisco DNA Center to access the IP address and add the untrusted certificate to the trustpool.

d) Click **Allow**.

Step 4 In the **Username** and **Password** fields, enter the IPAM credentials.

Step 5 From the **Provider** drop-down list, choose a provider.

Note If you choose **BlueCat** as your provider, ensure that your user has been granted API access in the BlueCat Address Manager. See your **BlueCat** documentation for information about configuring API access for your user or users.

Step 6 From the **View** drop-down list, choose a default IPAM network view. If you only have one view configured, only **default** appears in the drop-down list. The network view is created in the IPAM and is used as a container for IP address pools.

Step 7 Click **Save**.

What to do next

Go to **System** > **Settings** > **Trust & Privacy** > **Trustpool** to verify that the certificate has been successfully added.

Note In Trustpool, the certificate is referenced as a third-party trusted certificate.

Go to **System** > **System 360** and verify the information to ensure that your external IP address manager configuration succeeded.

Configure Webex Integration

Cisco DNA Center provides Webex meeting session information for client 360.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **External Services** > **Webex Integration**.

Step 2 Click **Authenticate to Webex**.

Step 3 In the **Cisco Webex** pop-up window, enter the email address and click **Sign In**.

Step 4 Enter the password and click **Sign In**.

Webex authentication is completed successfully.

Step 5 Under **Default Email Domain for Webex Meetings Sign-In**, enter the Webex user's email domain and click **Save**.

The Webex domain is organization-wide, and all users who use the domain can host or attend meetings.

Step 6 (Optional) Under **Authentication Token**, click **Delete** to delete Webex authentication.

Configure ThousandEyes Integration

You can configure Cisco DNA Center to communicate with an external ThousandEyes API agent to enable ThousandEyes integration using an authentication token. After integration, Cisco DNA Center provides ThousandEyes agent test data in the Application Health dashboard.

Before you begin

Ensure that you have deployed the ThousandEyes agent through application hosting, which supports Cisco Catalyst 9300 and 9400 Series wireless controllers.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **External Services** > **ThousandEyes Integration**.

Step 2 In the **Insert new token here** field, enter the authentication token.

Note To receive the OAuth Bearer Token, go to the **ThousandEyes** page.

Step 3 Click **Save**.

Configure Debugging Logs

To assist in troubleshooting service issues, you can change the logging level for the Cisco DNA Center services.

A logging level determines the amount of data that is captured in the log files. Each logging level is cumulative; that is, each level contains all the data generated by the specified level and higher levels, if any. For example, setting the logging level to **Info** also captures **Warn** and **Error** logs. We recommend that you adjust the logging level to assist in troubleshooting issues by capturing more data. For example, by adjusting the logging level, you can capture more data to review in a root cause analysis or RCA support file.

The default logging level for services is informational (**Info**). You can change the logging level from informational to a different logging level (**Debug** or **Trace**) to capture more information.

Caution Due to the type of information that might be disclosed, logs collected at the **Debug** level or higher should have restricted access.

Note Log files are created and stored in a centralized location on your Cisco DNA Center host. From this location, Cisco DNA Center can query and display logs in the GUI. The total compressed size of the log files is 2 GB. If the log files exceed 2 GB, the newer log files overwrite the older ones.

Before you begin

Only a user with SUPER-ADMIN-ROLE permissions can perform this procedure. For more information, see About User Roles.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **System Configuration** > **Debugging Logs**.

The **Debugging Logs** window displays the following fields:

- **Services**
- **Logger Name**
- **Logging Level**
- **Timeout**

Step 2 From the **Services** drop-down list, choose a service to adjust its logging level.

The **Services** drop-down list displays the services that are currently configured and running on Cisco DNA Center.

Step 3 Enter the **Logger Name**.

This is an advanced feature that has been added to control which software components emit messages into the logging framework. Use this feature with care. Misuse of this feature can result in loss of information needed for technical support purposes. Log messages will be written only for the loggers (packages) specified here. By default, the Logger Name includes packages that start with *com.cisco*. You can enter additional package names as comma-separated values. Do not remove the default values unless you are explicitly directed to do so. Use * to log all packages.

Step 4 From the **Logging Level** drop-down list, choose the new logging level for the service.

Cisco DNA Center supports the following logging levels in descending order of detail:

- **Trace**: Trace messages
- **Debug**: Debugging messages
- **Info**: Normal, but significant condition messages
- **Warn**: Warning condition messages
- **Error**: Error condition messages

Step 5 From the **Timeout** field, choose the time period for the logging level.

Configure logging-level time periods in increments of 15 minutes up to an unlimited time period. If you specify an unlimited time period, the default level of logging should be reset each time a troubleshooting activity is completed.

Step 6 Review your selection and click **Apply**.

(To cancel your selection, click **Cancel**.)

Configure the Network Resync Interval

You can update the polling interval at the global level for all devices by choosing **System** > **Settings** > **Network Resync Interval**. Or, you can update the polling interval at the device level for a specific device by choosing **Device Inventory**. When you set the polling interval using the **Network Resync Interval**, that value takes precedence over the **Device Inventory** polling interval value.

Before you begin

- Only a user with SUPER-ADMIN-ROLE permissions can perform this procedure. For more information, see About User Roles.
- Make sure that you have devices in your inventory. If not, discover devices using the Discovery feature.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Device Settings** > **Network Resync Interval**.

Step 2 In the **Resync Interval** field, enter a new time value (in minutes).

Step 3 (Optional) Check the **Override for all devices** check box to override the existing configured polling interval for all devices.

Step 4 Click **Save**.

View Audit Logs

Audit logs capture information about the various applications running on Cisco DNA Center. Audit logs also capture information about device public key infrastructure (PKI) notifications. The information in these audit logs can be used to assist in troubleshooting issues, if any, involving the applications or the device PKI certificates.

Audit logs also record system events that occurred, when and where they occurred, and which users initiated them. With audit logging, configuration changes to the system get logged in separate log files for auditing.

Step 1 Click the menu icon (≡) and choose **Activities** > **Audit Logs**.

The **Audit Logs** window appears, where you can view logs about the current policies in your network. These policies are applied to network devices by the applications installed on Cisco DNA Center.

Step 2 Click the timeline slider to specify the time range of data you want displayed on the window:

- In the **Time Range** area, choose a time range: **Last 2 Weeks**, **Last 7 Days**, **Last 24 Hours**, or **Last 3 Hours**.
- To specify a custom range, click **By Date** and specify the start and end date and time.
- Click **Apply**.

Step 3 Click the arrow next to an audit log to view the corresponding child audit logs.

Each audit log can be a parent to several child audit logs. By clicking the arrow, you can view a series of additional child audit logs.

Note An audit log captures data about a task performed by Cisco DNA Center. Child audit logs are subtasks to a task performed by Cisco DNA Center.

Step 4 (Optional) From the list of audit logs in the left pane, click a specific audit log message. In the right pane, click **Event ID** > **Copy Event ID to Clipboard**. With the copied ID, you can use the API to retrieve the audit log message based on the event ID.

The audit log displays the **Description**, **User**, **Interface**, and **Destination** of each policy in the right pane.

Note The audit log displays northbound operation details such as POST, DELETE, and PUT with payload information, and southbound operation details such as the configuration pushed to a device. For detailed information about the APIs on Cisco DevNet, see Cisco DNA Center Platform Intent APIs.

Step 5 (Optional) Click **Filter** to filter the log by **User ID**, **Log ID**, or **Description**.

Step 6 Click **Subscribe** to subscribe to the audit log events.

A list of syslog servers appears.

Step 7 Check the syslog server check box that you want to subscribe to and click **Save**.

Note Uncheck the syslog server check box to unsubscribe from the audit log events and click **Save**.

Step 8 In the right pane, use the **Search** field to search for specific text in the log message.

Step 9 Click the menu icon (☰) and choose **Activities** > **Scheduled Tasks** to view upcoming, in progress, completed, and failed administrative tasks, such as OS updates or device replacements.

Step 10 Click the menu icon (☰) and choose **Activities** > **Work Items** tab to view in progress, completed, and failed work items.

Export Audit Logs to Syslog Servers

Security Recommendation: We strongly encourage you to export audit logs from Cisco DNA Center to a remote syslog server in your network, for more secure and easier log monitoring.

You can export the audit logs from Cisco DNA Center to multiple syslog servers by subscribing to them.

Before you begin

You must configure the syslog servers in the **System** > **Settings** > **External Services** > **Destinations** > **Syslog** area.

Step 1 Click the menu icon (☰) and choose **Activities** > **Audit Logs**.

Step 2 Click **Subscribe**.

Step 3 Select the syslog servers that you want to subscribe to and click **Save**.

Step 4 To unsubscribe, deselect the syslog servers and click **Save**.

View Tasks

Tasks shows the information about in progress, completed, and failed tasks running on Cisco DNA Center.

Step 1 Click the menu icon (☰) and choose **Activities** > **Tasks**.

In the left pane, the **SUMMARY** area lists the following:

- **Status**: Lists and displays the **Upcoming**, **In Progress**, **Success**, and **Failed** tasks.
- **Last Updated**: Lists and displays the tasks updated in the last **3 Hours**, **24 Hours**, or **7 Days**.
- **Categories**: Lists and displays the tasks based on multiple categories. You can choose multiple categories at a time.
- **Recurring**: Lists and displays the recurring tasks.

Step 2 Click the task link to open a slide in pane that shows **Starts**, **Status**, **Last updated**, and additional information about upcoming, in progress, completed, and failed tasks.

Step 3 In the failed task slide in pane, click the **Download Error Report** link to download an error report of respective task.

A tar file is created and is saved to your local machine.

Note While creating a support case you can attach the downloaded error report in addition to other details you may want to include.

Activate High Availability

Complete the following procedure in order to activate high availability (HA) on your Cisco DNA Center cluster:

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **System Configuration** > **High Availability**.

Step 2 Click **Activate High Availability**.

For more information about HA, see the *Cisco DNA Center High Availability Guide*.

Configure Integration Settings

In cases where firewalls or other rules exist between Cisco DNA Center and any third-party apps that need to reach the Cisco DNA Center platform, you will need to configure **Integration Settings**. These cases occur when the IP address of Cisco DNA Center is internally mapped to another IP address that connects to the internet or an external network.

Important After a backup and restore of Cisco DNA Center, you need to access the **Integration Settings** page and update (if necessary) the **Callback URL Host Name** or **IP Address** using this procedure.

Before you begin

You have installed the Cisco DNA Center platform.

Step 1 Click the menu icon (☰) and choose **System Settings** > **Settings** > **Integration Settings**.

Step 2 Enter the **Callback URL Host Name** or **IP Address** that the third-party app needs to connect to when communicating with the Cisco DNA Center platform.

Note The **Callback URL Host Name** or **IP Address** is the external facing hostname or IP address that is mapped internally to Cisco DNA Center. Configure the VIP address for a three-node cluster setup.

Step 3 Click **Apply**.

Set Up a Login Message

You can set up a message that appears to all users after they log in to Cisco DNA Center.

Before you begin

Only a user with **SUPER-ADMIN-ROLE** or **CUSTOM-ROLE** with system management permissions can perform this procedure.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **System Configuration** > **Login Message**.

Step 2 In the **Login Message** text box, enter the message's text.

Step 3 Click **Save**.

The message appears below the **Log In** button on the Cisco DNA Center login page.

Later, if you want to remove this message, do the following:

a. Return to the **Login Message** settings page.

b. Click **Clear** and then click **Save**.

Configure the Proxy

If Cisco DNA Center has a proxy server configured as an intermediary between itself and the network devices it manages or the Cisco cloud from which it downloads software updates, you must configure access to the proxy server. You configure access using the **Proxy Config** window in the Cisco DNA Center GUI.

Note Cisco DNA Center does not support a proxy server that uses Windows New Technology LAN Manager (NTLM) authentication.

Before you begin

Only a user with SUPER-ADMIN-ROLE permissions can perform this procedure. For more information, see About User Roles.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **System Configuration** > **Proxy Config**.

Step 2 Enter the proxy server's URL address.

Step 3 Enter the proxy server's port number.

For HTTP, the port number is usually 80.

Step 4 (Optional) If the proxy server requires authentication, enter the username and password for access to the proxy server.

Step 5 Check the **Validate Settings** check box to have Cisco DNA Center validate your proxy configuration settings when applying them.

Step 6 Review your selections and click **Save**.

To cancel your selection, click **Reset**. To delete an existing proxy configuration, click **Delete**.

After configuring the proxy, you are able to view the configuration in the **Proxy Config** window.

Security Recommendations

Cisco DNA Center provides many security features for itself, as well as for the hosts and network devices that it monitors and manages. You must clearly understand and configure the security features correctly. We strongly recommend that you follow these security recommendations:

- Deploy Cisco DNA Center in a private internal network and behind a firewall that does not expose Cisco DNA Center to an untrusted network, such as the internet.
- If you have separate management and enterprise networks, connect Cisco DNA Center's management and enterprise interfaces to your management and enterprise networks, respectively. Doing so ensures network isolation between services used to administer and manage Cisco DNA Center and services used to communicate with and manage your network devices.
- If deploying Cisco DNA Center in a three-node cluster setup, verify that the cluster interfaces are connected in an isolated network.
- Upgrade Cisco DNA Center with critical upgrades, including security patches, as soon as possible after a patch announcement. For more information, see the Cisco DNA Center Upgrade Guide.
- Restrict the remote URLs accessed by Cisco DNA Center using an HTTPS proxy server. Cisco DNA Center is configured to access the internet to download software updates, licenses, and device software, as well as provide up-to-date map information, user feedback, and so on. Providing internet connections for these purposes is a mandatory requirement. However, provide connections securely through an HTTPS proxy server.
- Restrict the ingress and egress management and enterprise network connections to and from Cisco DNA Center using a firewall, by only allowing known IP addresses and ranges and blocking network connections to unused ports.
- Replace the self-signed server certificate from Cisco DNA Center with the certificate signed by your internal certificate authority (CA).
- If possible in your network environment, disable SFTP Compatibility Mode. This mode allows legacy network devices to connect to Cisco DNA Center using older cipher suites.
- Disable the browser-based appliance configuration wizard, which comes with a self-signed certificate.
- Upgrade the minimum TLS version. Cisco DNA Center comes with TLSv1.1 and TLSv1.2 enabled by default, and we recommend that you set the minimum TLS version to 1.2 if possible in your network environment. For more information, see Change the Minimum TLS Version and Enable RC4-SHA (Not Secure), on page 72.

Change the Minimum TLS Version and Enable RC4-SHA (Not Secure)

Security Recommendation: We recommend that you upgrade the minimum TLS version to TLSv1.2 for incoming TLS connections to Cisco DNA Center.

Northbound REST API requests from the external network such as northbound REST API-based apps, browsers, and network devices connecting to Cisco DNA Center using HTTPS are made secure using the Transport Layer Security (TLS) protocol.

By default, Cisco DNA Center supports TLSv1.1 and TLSv1.2, and does not support RC4 ciphers for SSL/TLS connections. Since RC4 ciphers have well known weaknesses, we recommend that you upgrade the minimum TLS version to TLSv1.2 if your network devices support it.

Cisco DNA Center provides a configuration option to downgrade the minimum TLS version and enable RC4-SHA, if your network devices under Cisco DNA Center control cannot support the existing minimum TLS version (TLSv1.1) or ciphers. For security reasons, however, we do not recommend that you downgrade Cisco DNA Center TLS version or enable RC4-SHA ciphers.

If you need to change the TLS version or enable RC4-SHA for Cisco DNA Center, you do so by logging in to the appliance and using the CLI.

Note CLI commands can change from one release to the next. The following CLI example uses command syntax that might not apply to all Cisco DNA Center releases.

Before you begin

You must have maglev SSH access privileges to perform this procedure.

Important This security feature applies to port 443 on Cisco DNA Center. Performing this procedure may disable traffic on the port to the Cisco DNA Center infrastructure for a few seconds. For this reason, you should configure TLS infrequently and only during off-peak hours or during a maintenance period.

Step 1 Using an SSH client, log in to the Cisco DNA Center appliance with the IP address that you specified using the configuration wizard.

The IP address to enter for the SSH client is the IP address that you configured for the network adapter. This IP address connects the appliance to the external network.

Step 2 When prompted, enter your username and password for SSH access.

Step 3 Enter the following command to check the TLS version currently enabled on the cluster.

Example

```
Input
$ magctl service tls_version --tls-min-version show
Output
TLS minimum version is 1.1
```

Step 4 If you want to change the TLS version on the cluster, enter the following commands. For example, you might want to change the current TLS version to a lower version if your network devices under Cisco DNA Center control cannot support the existing TLS version.

Example: Change from TLS version 1.1 to 1.0

```
Input
$ magctl service tls_version --tls-min-version 1.0
Output
Enabling TLSv1.0 is recommended only for legacy devices
Do you want to continue? [y/N]: y
WARNING: Enabling TLSv1.0 for api-gateway
deployment.extensions/kong patched
```

Example: Change from TLS version 1.1 to 1.2 (only allowed if you haven't enabled RC4-SHA)

```
Input
$ magctl service tls_version --tls-min-version 1.2
Output
Enabling TLSv1.2 will disable TLSv1.1 and below
Do you want to continue? [y/N]: y
WARNING: Enabling TLSv1.2 for api-gateway
deployment.extensions/kong patched
```

Note Setting TLS version 1.2 as the minimum version is not supported when RC4-SHA ciphers are enabled.

Step 5 Enter the following command to enable RC4-SHA on the cluster (not secure; proceed only if needed).

Enabling RC4-SHA ciphers is not supported when TLS version 1.2 is the minimum version.

Example: TLS version 1.2 is not enabled

```
Input
$ magctl service ciphers --ciphers-rc4=enable kong
Output
Enabling RC4-SHA cipher will have security risk
Do you want to continue? [y/N]: y
WARNING: Enabling RC4-SHA Cipher for kong
deployment.extensions/kong patched
```

Step 6 Enter the following command at the prompt to confirm that TLS and RC4-SHA are configured.

Example

```
Input
$ magctl service display kong
Output
      containers:
      - env:
        - name: TLS_V1
          value: "1.1"
        - name: RC4_CIPHERS
          value: "true"
```

If RC4 and TLS minimum versions are set, they are listed in the env: of the **magctl service display kong** command. If these values are not set, they do not appear in the env:.

Step 7 If you want to disable the RC4-SHA ciphers that you enabled previously, enter the following command on the cluster.

```
Input
$ magctl service ciphers --ciphers-rc4=disable kong
Output
WARNING: Disabling RC4-SHA Cipher for kong
deployment.extensions/kong patched
```

Step 8 Log out of the Cisco DNA Center appliance.

Configure the Proxy Certificate

In some network configurations, proxy gateways might exist between Cisco DNA Center and the remote network it manages (containing various network devices). Common ports, such as 80 and 443, pass through the gateway proxy in the DMZ, and for this reason, SSL sessions from the network devices meant for Cisco DNA Center terminate at the proxy gateway. Therefore, the network devices located within these remote networks can only communicate with Cisco DNA Center through the proxy gateway. For the network devices to establish secure and trusted connections with Cisco DNA Center, or, if present, a proxy gateway, the network devices should have their PKI trust stores appropriately provisioned with the relevant CA root certificates or the server's own certificate under certain circumstances.

If such a proxy is in place during onboarding of devices through PnP Discovery/Services, we recommend that the proxy and the Cisco DNA Center server certificate be the same so that network devices can trust and authenticate Cisco DNA Center securely.

In network topologies where a proxy gateway is present between Cisco DNA Center and the remote network it manages, perform the following procedure to import a proxy gateway certificate in to Cisco DNA Center.

Before you begin

- Only a user with SUPER-ADMIN-ROLE permissions can perform this procedure. For more information, see About User Roles.
- You must use the proxy gateway's IP address to reach Cisco DNA Center and its services.
- You should have the certificate file that is currently being used by the proxy gateway. The certificate file contents should consist of any of the following:
  - The proxy gateway's certificate in PEM or DER format, with the certificate being self-signed.
  - The proxy gateway's certificate in PEM or DER format, with the certificate being issued by a valid, well-known CA.
  - The proxy gateway's certificate and its chain in PEM or DER format.

The certificate used by the devices and the proxy gateway must be imported in to Cisco DNA Center by following this procedure.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **Proxy Certificate**.

Step 2 In the **Proxy Certificate** window, view the current proxy gateway certificate data (if it exists).

Note The **Expiration Date and Time** is displayed as a Greenwich Mean Time (GMT) value. A system notification appears in the Cisco DNA Center GUI two months before the certificate expires.

Step 3 To add a proxy gateway certificate, drag and drop the self-signed or CA certificate into the **Drag and Drop Here** area.

Note Only PEM or DER files (public-key cryptography standard file formats) can be imported into Cisco DNA Center using this area. Additionally, private keys are neither required nor uploaded into Cisco DNA Center for this procedure.

Step 4 Click **Save**.

Step 5 Refresh the **Proxy Certificate** window to view the updated proxy gateway certificate data.

The information displayed in the **Proxy Certificate** window should have changed to reflect the new certificate name, issuer, and certificate authority.

Step 6 Click the **Enable** button to enable the proxy gateway certificate functionality.

If you click the **Enable** button, the controller returns the imported proxy gateway certificate when requested by a proxy gateway. If you don't click the **Enable** button, the controller returns its own self-signed or imported CA certificate to the proxy gateway.

The **Enable** button is dimmed if the proxy gateway certificate functionality is used.

Upload an SSL Intercept Proxy Certificate

Step 1 Transfer your proxy server's certificate (in .pem format) to the `/home/maglev` directory on the Cisco DNA Center server.

Step 2 As the maglev user, SSH to the Cisco DNA Center server and enter the following command, where <*proxy.pem*> is your proxy server's TLS/SSL certificate file:

```
$ sudo /usr/local/bin/update_cacerts.sh -v -a /home/maglev/<proxy.pem>
```

The command returns output that is similar to the following:

```
Reading CA cert from file /tmp/sdn.pem
Adding certificate import_1E:94:6D:2C:81:22:BB:B2:2E:24:BD:72:57:AE:35:AD:EC:5E:71:44.crt
Updating /etc/ca-certificates.conf
Updating certificates in /etc/ssl/certs…
1 added, 0 removed; done.
Running hooks in /etc/ca-certificates/update.d…
done.
Deleting tempfiles /tmp/file0PpQxV /temp/filePtmQ8U /tmp/filercR3cV
```

Step 3 In the command output, look for the line "1 added" and confirm that the number added is not zero. The number can be 1 or more than 1, based on the certificates in the chain.

Step 4 Enter the following commands to restart docker and the catalog server:

```
sudo systemctl restart docker
magctl service restart -d catalogserver
```

Step 5 Check cloud connectivity from the Cisco DNA Center GUI.

Certificate and Private Key Support

Cisco DNA Center supports the PKI Certificate Management feature, which is used to authenticate sessions (HTTPS). These sessions use commonly recognized trusted agents called CAs. Cisco DNA Center uses the PKI Certificate Management feature to import, store, and manage X.509 certificates from your internal CA. The imported certificate becomes an identity certificate for Cisco DNA Center, and Cisco DNA Center presents this certificate to its clients for authentication. The clients are the northbound API applications and network devices.

You can import the following files (in either PEM or PKCS file format) using the Cisco DNA Center GUI:

- X.509 certificate

- Private key

Note For the private key, Cisco DNA Center supports the import of RSA keys. You should not import DSA, DH, ECDH, and ECDSA key types, because they are not supported. You should also keep the private key secure in your own key management system. The private key must have a minimum modulus size of 2048 bits.

Prior to import, you must obtain a valid X.509 certificate and private key issued by your internal CA and the certificate must correspond to a private key in your possession. After import, the security functionality based on the X.509 certificate and private key is automatically activated. Cisco DNA Center presents the certificate to any device or application that requests it. Northbound API applications and network devices can use these credentials to establish a trust relationship with Cisco DNA Center.

Note We recommend that you do not use and import a self-signed certificate into Cisco DNA Center. We recommend that you import a valid X.509 certificate from your internal CA. Additionally, you must replace the self-signed certificate (installed in Cisco DNA Center by default) with a certificate that is signed by your internal CA for the PnP functionality to work correctly.

Cisco DNA Center supports only one imported X.509 certificate and private key at a time. When you import a second certificate and private key, the latter overwrites the first (existing) imported certificate and private key values.

Certificate Chain Support

Cisco DNA Center is able to import certificates and private keys through its GUI. If subordinate certificates are involved in a certificate chain leading to the certificate that is to be imported into Cisco DNA Center (signed certificate), both the subordinate certificates as well as the root certificate of these subordinate CAs must be appended together into a single file to be imported. When appending these certificates, you must append them in the same order as the actual chain of certification.

The following certificates should be pasted together into a single PEM file. Review the certificate subject name and issuer to ensure that the correct certificates are being imported and correct order is maintained. Ensure that all of the certificates in the chain are pasted together.

- **Signed Cisco DNA Center certificate**: Its Subject field includes CN=<*FQDN of Cisco DNA Center*>, and the issuer has the CN of the issuing authority.

Note If you install a certificate signed by your internal certificate authority (CA), ensure that the certificate specifies all of the DNS names (including the Cisco DNA Center FQDN) that are used to access Cisco DNA Center in the **alt_names** section. For more information, see "Generate a Certificate Request Using Open SSL" in the Cisco DNA Center Security Best Practices Guide.

- **Issuing (subordinate) CA certificate that issues the Cisco DNA Center certificate**: Its Subject field has CN of the (subordinate) CA that issues the Cisco DNA Center certificate, and the issuer is that of the root CA.

- **Next issuing (root/subordinate CA) certificate that issues the subordinate CA certificate**: Its Subject field is the root CA, and the issuer has the same value as the Subject field. If they are not the same, you must append the next issuer, and so on.

Update the Cisco DNA Center Server Certificate

Cisco DNA Center supports the import and storage of an X.509 certificate and private key into Cisco DNA Center. After import, the certificate and private key can be used to create a secure and trusted environment between Cisco DNA Center, northbound API applications, and network devices.

You can import a certificate and a private key using the **Certificates** window in the GUI.

Before you begin

You must obtain a valid X.509 certificate that is issued by your internal CA and the certificate must correspond to a private key in your possession.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **System Certificates**.

Step 2 In the **System** tab, view the current certificate data.

When you first view this window, the current certificate data that is displayed is the Cisco DNA Center self-signed certificate. The self-signed certificate's expiry is set for several years in the future.

Note The expiration date and time is displayed as a Greenwich mean time (GMT) value. A system notification appears in the Cisco DNA Center GUI two months before the certificate expires.

The **System** tab displays the following fields:

- **Current Certificate Name**: Name of the current certificate
- **Issuer**: Name of the entity that has signed and issued the certificate
- **Authority**: Either self-signed or the name of the CA
- **Expires**: Expiry date of the certificate

Step 3 In the **System Certificates** window, click **Replace Certificate**.

If you are generating the CSR for the first time, you will see the **Generate New CSR** link, Otherwise, you will see **Download existing CSR** link. You can download the existing CSR and submit it to your provider to generate your certificate. If you don't want to use the existing CSR, click **Delete existing CSR** and click **Accept** in the subsequent **Confirmation** window. You can now see the **Generate New CSR** link.

Step 4 Click **Generate New CSR** link.

Step 5 In the **Certificate Signing Request Generator** window, complete the required fields.

Step 6 Click **Generate New CSR**.

The generated new CSR is downloaded automatically.

Step 7 (Optional) Check the **Use system certificate for Disaster Recovery as well** check box if you want to use the same certificate for disaster recovery.

Step 8 Choose the file format type for the certificate that you are importing into Cisco DNA Center:

- **PEM**: Privacy-enhanced mail file format

- **PKCS**: Public-Key Cryptography Standard file format

Note **PKCS** file type is disabled if you choose the **Generate New CSR** option to request certificate.

Step 9 If you choose **PEM**, perform the following tasks:

- Import the **PEM** file by dragging and dropping the file into the Drag and Drop area.

Note A PEM file must have a valid PEM format extension (.pem). The maximum file size for the certificate is 10 MB.

After the upload succeeds, the system certificate is validated.

- Import the **Private Key** by dragging and dropping the file into the Drag and Drop area.

Note Private keys must have a valid private key format extension (.key). The maximum file size for the private key is 10 MB.

After the upload succeeds, the private key is validated.

  - Choose the encryption option from the **Encrypted** area for the private key.
  - If you chose encryption, enter the password for the private key in the Password field.

Step 10 If you choose **PKCS**, perform the following tasks:

- Import the **PKCS** file by dragging and dropping the file into the Drag and Drop area.

Note A PKCS file must have a valid PKCS format extension (.pfx or .p12). The maximum file size for the certificate is 10 MB.

After the upload succeeds, the system certificate is validated.

- enter the passphrase for the certificate in the Password field.

Note For PKCS, the imported certificate also requires a passphrase.

- For the **Private Key** field, choose the encryption option for the private key.
- For the **Private Key** field, if encryption is chosen, enter the password for the private key in the **Password** field.

Step 11 Click **Save**.

Note After the Cisco DNA Center server's SSL certificate is replaced, you are automatically logged out and you must log in again.

Step 12 Return to the **Certificates** window to view the updated certificate data.
The information displayed in the **System** tab should have changed to reflect the new certificate name, issuer, and the certificate authority.

Use an External SCEP Broker

You can use your own PKI broker and certificate service for devices and Cisco DNA Center. You can also enable and disable the use of an external device PKI or deprecate the settings between one or the other.

To upload an external PKI broker:

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **PKI Certificates**.

Step 2 In the PKI Certificates window, click the **Use external SCEP broker** radio button.

Step 3 Use one of the following options to upload an external certificate:

- Choose a file
- Drag and drop to upload

Note Only file types such as .pem, .crt, and .cer are accepted. The file size cannot exceed 10 MB.

Step 4 Click **Upload**.

Step 5 By default, **Manages Device Trustpoint** is enabled, meaning Cisco DNA Center configures the sdn-network-infra-iwan trustpoint on the device. You must complete the following steps:

a) Enter the enrollment URL where the device requests the certificate via SCEP.

b) (Optional) Enter any optional subject fields used by the certificate, such as country, locality, state, organization, and organization unit. The common name (CN) is automatically configured by Cisco DNA Center with the device platform ID and device serial number.

c) In the **Revocation Check** field, click the drop-down list and choose the appropriate revocation check option.

d) (Optional) Check the **Auto Renew** check box and enter an auto enrollment percentage.

If **Manages Device Trustpoint** is disabled, in order for devices to send wired and wireless Assurance telemetry to Cisco DNA Center, you must manually configure the sdn-network-infra-iwan trustpoint on the device and then import a certificate. See Configure the Device Certificate Trustpoint.

Step 6 Click **Save**.

The external CA certificate is uploaded.

If you want to replace the uploaded external certificate, click **Replace Certificate** and enter the required details.

Switch Back to an Internal PKI Certificate

After uploading an external certificate, if you want to switch back to the internal certificate, do the following:

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **PKI Certificates**.

Step 2 In the PKI Certificates window, click the **Use Cisco DNA Center** radio button.

Step 3 In the **Switching back to Internal PKI Certificate** alert, click **Apply**.

The **Settings have been updated** message appears. For more information, see Change the Role of the PKI Certificate from Root to Subordinate

Export the Cisco DNA Center PKI Certificate

Cisco DNA Center allows you to download the device certificates that are required to set up an external entity such as a AAA (pronounced "triple A") server or Cisco ISE server to authenticate the devices.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **PKI Certificates**.

Step 2 Click **Download CA Certificate** to export the device CA and add it as the trusted CA on the external entities.

Certificate Management

Manage Device Certificates

You can view and manage certificates that are issued by Cisco DNA Center for managed devices to authenticate and identify the devices.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **Device Certificate**.

The **Device Certificate** window shows the status of issued certificates in separate status tabs:

- **Expired** status tab: Shows the list of certificates whose lifetime has expired.
- **Expiring** status tab: Shows the list of certificates that are nearing the expiry date, in the ascending order.
- **All** status tab: Shows the list of valid, expired, and expiring certificates.
- **Revoked** status tab: Shows the certificates that are revoked.

Step 2 If you want to search certificates, enter the search string in the search field.

The certificates that match the **Issue To** value in the chosen status tab are displayed.

Step 3 If you want to revoke a valid certificate, do the following:

a) Click the **All** status tab.
b) In the **Actions** column, click the **Revoke** icon that corresponds to the certificate that you want to revoke.
c) In the confirmation window, click **OK**.

Step 4 If you want to export the certificate details, click **Export**.

The certificate details are exported in CSV format.

Configure the Device Certificate Lifetime

Cisco DNA Center lets you change the certificate lifetime of network devices that are managed and monitored by the private (internal) Cisco DNA Center CA. The Cisco DNA Center default value for the certificate lifetime is 365 days. After the certificate lifetime value is changed using the Cisco DNA Center GUI, network devices that subsequently request a certificate from Cisco DNA Center are assigned this lifetime value.

Note The device certificate lifetime value cannot exceed the CA certificate lifetime value. Additionally, if the remaining lifetime of the CA certificate is less than the configured device's certificate lifetime, the device gets a certificate lifetime value that is equal to the remaining CA certificate lifetime.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **Device Certificate**.

Step 2 Review the device certificate and the current device certificate lifetime.

Step 3 In the **Device Certificate** window, click **Modify**.

Step 4 In the **Device Certificate Lifetime** dialog box, enter a new value, in days.

Step 5 Click **Save**.

Change the Role of the PKI Certificate from Root to Subordinate

The device PKI CA, a private CA that is provided by Cisco DNA Center, manages the certificates and keys used to establish and secure server-client connections. To change the role of the device PKI CA from a root CA to a subordinate CA, complete the following procedure.

When changing the private Cisco DNA Center CA from a root CA to a subordinate CA, note the following:

- If you intend to have Cisco DNA Center act as a subordinate CA, it is assumed that you already have a root CA, for example, Microsoft CA, and you are willing to accept Cisco DNA Center as a subordinate CA.
- As long as the subordinate CA is not fully configured, Cisco DNA Center continues to operate as an internal root CA.
- You must generate a Certificate Signing Request file for Cisco DNA Center (as described in the following procedure) and have it manually signed by your external root CA.

Note Cisco DNA Center continues to run as an internal root CA during this time period.

- After the Certificate Signing Request is signed by the external root CA, this signed file must be imported back into Cisco DNA Center using the GUI (as described in the following procedure).

  After the import, Cisco DNA Center initializes itself as the subordinate CA and provides all the existing functionalities of a subordinate CA.
- The switchover from the internal root CA to the subordinate CA used by managed devices is not automatically supported. Therefore, it is assumed that no devices have been configured with the internal root CA yet. If devices are configured, it is the responsibility of the network administrator to manually revoke the existing device ID certificates before switching to the subordinate CA.
- The subordinate CA certificate lifetime, as displayed in the GUI, is just read from the certificate; it is not computed against the system time. Therefore, if you install a certificate with a lifespan of 1 year today and look at it in the GUI next July, the GUI will still show that the certificate has a 1-year lifetime.
- The subordinate CA certificate must be in PEM or DER format only.
- The subordinate CA does not interact with the higher CAs; therefore, it is not aware of revocation, if any, of the certificates at a higher level. Due to this, any information about certificate revocation is also not communicated from the subordinate CA to the network devices. Because the subordinate CA does not have this information, all the network devices use only the subordinate CA as the Cisco Discovery Protocol (CDP) source.

You can change the role of the private (internal) Cisco DNA Center CA from a root CA to a subordinate CA using the **PKI Certificate Management** window in the GUI.

Before you begin

You must have a copy of the root CA certificate.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **PKI Certificate**.

Step 2 Click the **CA Management** tab.

Step 3 Review the existing root or subordinate CA certificate configuration information from the GUI:

- **Root CA Certificate**: Displays the current root CA certificate (either external or internal).
- **Root CA Certificate Lifetime**: Displays the current lifetime value of the current root CA certificate, in days.
- **Current CA Mode**: Displays the current CA mode (root CA or subordinate CA).
- **Sub CA Mode**: Enables a change from a root CA to a subordinate CA.

Step 4 In the **CA Management** tab, check the **Sub CA Mode** check box.

Step 5 Click **Next**.

Step 6 Review the warnings that appear:

- Changing from root CA to subordinate CA is a process that cannot be reversed.
- You must ensure that no network devices have been enrolled or issued a certificate in root CA mode. Network devices that have been accidentally enrolled in root CA mode must be revoked before changing from root CA to subordinate CA.
- Network devices must come online only after the subordinate CA configuration process finishes.

Step 7 Click **OK** to proceed.

The **PKI Certificate Management** window displays the **Import External Root CA Certificate** field.

Step 8 Drag and drop your root CA certificate into the **Import External Root CA Certificate** field and click **Upload**.

The root CA certificate is uploaded into Cisco DNA Center and used to generate a Certificate Signing Request.

After the upload process finishes, a `Certificate Uploaded Successfully` message appears.

Step 9 Click **Next**.

Cisco DNA Center generates and displays the Certificate Signing Request.

Step 10 View the Cisco DNA Center-generated Certificate Signing Request in the GUI and perform one of the following actions:

- Click the **Download** link to download a local copy of the Certificate Signing Request file.

  You can then attach this Certificate Signing Request file to an email to send to your root CA.

- Click the **Copy to the Clipboard** link to copy the Certificate Signing Request file's content.

  You can then paste this Certificate Signing Request content to an email or include it as an attachment to an email and send it to your root CA.

Step 11 Send the Certificate Signing Request file to your root CA.

Your root CA will then return a subordinate CA file, which you must import back into Cisco DNA Center.

Step 12 After receiving the subordinate CA file from your root CA, access the Cisco DNA Center GUI again and return to the **PKI Certificate Management** window.

Step 13 Click the **CA Management** tab.

Step 14 Click **Yes** for the **Change CA mode** button.

After clicking **Yes**, the GUI view with the Certificate Signing Request is displayed.

Step 15 Click **Next**.

The **PKI Certificate Management** window displays the **Import Sub CA Certificate** field.

Step 16 Drag and drop your subordinate CA certificate into the **Import Sub CA Certificate** field and click **Apply**.

The subordinate CA certificate is uploaded into Cisco DNA Center.

After the upload finishes, the GUI displays the subordinate CA mode under the **CA Management** tab.

Step 17 Review the fields under the **CA Management** tab:

- **Sub CA Certificate**: Displays the current subordinate CA certificate.
- **External Root CA Certificate**: Displays the root CA certificate.
- **Sub CA Certificate Lifetime**: Displays the lifetime value of the subordinate CA certificate, in days.
- **Current CA Mode**: Displays SubCA mode.

Provision a Rollover Subordinate CA Certificate

Cisco DNA Center lets you apply a subordinate certificate as a rollover subordinate CA when 70 percent of the existing subordinate CA's lifetime has elapsed.

Before you begin

- To initiate subordinate CA rollover provisioning, you must have changed the PKI certificate role to subordinate CA mode. See Change the Role of the PKI Certificate from Root to Subordinate, on page 81.
- Seventy percent or more of the lifetime of the current subordinate CA certificate must have expired. When this occurs, Cisco DNA Center displays a **Renew** button under the **CA Management** tab.
- You must have a signed copy of the rollover subordinate CA PKI certificate.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **PKI Certificate**.

Step 2 Click the **CA Management** tab.

Step 3 Review the CA certificate configuration information:

- **Subordinate CA Certificate**: Displays the current subordinate CA certificate.

- **External Root CA Certificate**: Displays the root CA certificate.
- **Subordinate CA Certificate Lifetime**: Displays the lifetime value of the current subordinate CA certificate, in days.
- **Current CA Mode**: Displays SubCA mode.

Step 4 Click **Renew**.

Cisco DNA Center uses the existing subordinate CA to generate and display the rollover subordinate CA Certificate Signing Request.

Step 5 View the generated Certificate Signing Request in the GUI and perform one of the following actions:

- Click the **Download** link to download a local copy of the Certificate Signing Request file.

  You can then attach this Certificate Signing Request file to an email to send it to your root CA.

- Click the **Copy to the Clipboard** link to copy the Certificate Signing Request file's content.

  You can then paste this Certificate Signing Request content to an email or include it as an attachment to an email and send it to your root CA.

Step 6 Send the Certificate Signing Request file to your root CA.

Your root CA will then return a rollover subordinate CA file that you must import back into Cisco DNA Center.

The Certificate Signing Request for the subordinate CA rollover must be signed by the same root CA who signed the subordinate CA you imported when you switched from RootCA mode to SubCA mode.

Step 7 After receiving the rollover subordinate CA file from your root CA, return to the **PKI Certificate Management** window.

Step 8 Click the **CA Management** tab.

Step 9 Click **Next** in the GUI in which the Certificate Signing Request is displayed.

The **PKI Certificate Management** window displays the **Import Sub CA Certificate** field.

Step 10 Drag and drop your subordinate rollover CA certificate into the **Import Sub CA Certificate** field and click **Apply**.

The rollover subordinate CA certificate is uploaded into Cisco DNA Center.

After the upload finishes, the GUI changes to disable the **Renew** button under the **CA Management** tab.

Configure the Device Certificate Trustpoint

If **Manages Device Trustpoint** is disabled in Cisco DNA Center, in order for devices to send wired and wireless Assurance telemetry to Cisco DNA Center, you must manually configure the sdn-network-infra-iwan trustpoint on the device and then import a certificate.

The following manual configuration is required to enroll from an external CA via SCEP.

Step 1 Enter the following commands:

```
crypto pki trustpoint sdn-network-infra-iwan
  enrollment url http://<SCEP_enrollment_URL_to_external_CA>
  fqdn <device_FQDN>
  subject-name CN=<device_platform_ID>_<device_serial_number>_sdn-network-infra-iwan
```

```
 revocation-check <crl, crl none, or none>  # to perform revocation check with CRL, CRL fallback to
no check, or no check
 rsakeypair sdn-network-infra-iwan
 fingerprint <CA_fingerprint> # to verify that the CA at the url connection matches the fingerprint
given
```

Step 2 (Optional, but recommended) Automatically renew the certificate and avoid certificate expiry:

```
auto-enroll 80 regenerate
```

Step 3 (Optional) Specify the interface that is reachable to the enrollment URL. Otherwise, the default is the source interface of the http service.

```
source interface <interface>
```

Renew Certificates

Cisco DNA Center uses a number of certificates, such as the ones generated by Kubernetes and the ones used by Kong and Credential Manager Services. These certificates are valid for one year, which starts as soon as you install your cluster. Cisco DNA Center automatically renews these certificates for another year before they are set to expire.

- We recommend that you renew certificates before they expire, not after.
- You can only renew certificates that are set to expire up to 100 days from now. This procedure does not do anything to certificates that will expire later than that.
- The script refreshes only self-signed certificates, not third-party/certificate authority (CA)-signed certificates. For third-party/CA-signed certificates, the script updates the internal certificates used by Kubernetes and the Credential Manager.
- For self-signed certificates, the renewal process does not require you to push certificates back out to devices, because the root CA is unchanged.
- The term *cluster* applies to both single-node and three-node Cisco DNA Center setups.

Step 1 Ensure that each cluster node is healthy and not experiencing any issues.

Step 2 To view a list of the certificates that are currently used by that node and their expiration date, enter the following command:

```
sudo maglev-config certs info
```

Step 3 Renew the certificates that are set to expire soon by entering the following command:

```
sudo maglev-config certs refresh
```

Step 4 Repeat the preceding steps for the other cluster nodes.

Step 5 For utility help, enter:

```
$ sudo maglev-config certs --help
Usage: maglev-config certs [OPTIONS] COMMAND [ARGS]...

Options:
  --help  Show this message and exit.

Commands:
```

```
info
refresh
```

Configure Trustpool

Cisco DNA Center contains a preinstalled Cisco trustpool bundle (Cisco Trusted External Root Bundle). Cisco DNA Center also supports the import and storage of an updated trustpool bundle from Cisco. The trustpool bundle is used by supported Cisco networking devices to establish a trust relationship with Cisco DNA Center and its applications.

Note The Cisco trustpool bundle is a file called ios.p7b that only supported Cisco devices can unbundle and use. This ios.p7b file contains root certificates of valid certificate authorities, including Cisco. This Cisco trustpool bundle is available on the Cisco cloud (Cisco InfoSec). The link is located at https://www.cisco.com/security/pki/.

The trustpool bundle provides you with a safe and convenient way to use the same CA to manage all your network device certificates, as well as your Cisco DNA Center certificate. The trustpool bundle is used by Cisco DNA Center to validate its own certificate as well as a proxy gateway certificate (if any), to determine whether it is a valid CA-signed certificate. Additionally, the trustpool bundle is available for upload to Network PnP-enabled devices at the beginning of their PnP workflow so that they can trust Cisco DNA Center for subsequent HTTPS-based connections.

You import the Cisco trust bundle using the **Trustpool** window in the GUI.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **Trustpool**.

Step 2 In the **Trustpool** window, click the **Update** button to initiate a new download and install of the trustpool bundle.

The **Update** button becomes active only when an updated version of the ios.p7b file is available and internet access is available.

After the new trustpool bundle is downloaded and installed on Cisco DNA Center, Cisco DNA Center makes this trustpool bundle available to supported Cisco devices for download.

Step 3 If you want to import a new certificate file, click **Import**, choose a valid certificate file from your local system, and click **Import** in the **Import Certificate** window.

Step 4 Click **Export** to export the certificate details in CSV format.

Disable Restricted Shell Temporarily

For added security, Cisco DNA Center supports restricted shell. With restricted shell, users do not have access to the underlying operating system and file system, which reduces operational risk.

The following commands are supported in restricted shell:

```
$ ?
Help:
  cat                  concatenate and print files in restricted mode
```

```
clear                clear the terminal screen
date                display the current time in the given FORMAT, or set the system date

debug                enable console debug logs
df                   file system information
dmesg                print or control the kernel ring buffer.
du                summarize disk usage of the set of FILEs, recursively for directories.

free                 quick summary of memory usage
history              enable shell commands history
htop                 interactive process viewer.
ip                   print routing, network devices, interfaces and tunnels.
last                 show a listing of last logged in users.
ls                   restricted file system view chrooted to maglev Home
lscpu                print information about the CPU architecture.
magctl               tool to manage a Maglev deployment
maglev               maglev admin commands
maglev-config        tool to configure a Maglev deployment
manufacture_check    tool to perform manufacturing checks
netstat              print networking information.
nslookup             query Internet name servers interactively.
ntpq                 standard NTP query program.
ping                 send ICMP ECHO_REQUEST to network hosts.
ps                   check status of active processes in the system
rca                  root cause analysis collection utilities
reboot               Reboot the machine
rm                   delete files in restricted mode
route                print the IP routing table.
runonce              Execute runonce scripts
scp                  restricted secure copy
sftp                 secure file transfer
shutdown             Shutdown the machine
ssh                  OpenSSH SSH client.
tail                 Print the last 10 lines of each FILE to standard output
top                  display sorted list of system processes
traceroute           print the route packets trace to network host.
uname                print system information.
uptime               tell how long the system has been running.
vi                   text editor
w                    show who is logged on and what they are doing.
```

If your network uses any CLI-based scripts or troubleshooting commands, you do have the option of bypassing the restricted shell in the current Cisco DNA Center release. By default, restricted shell is enabled in Cisco DNA Center 2.3.2. If you want to disable restricted shell, complete the following steps.

Step 1 Enter the following CLI command to determine your shell type:

```
$ magctl ssh shell display
```

The command returns one of the following outputs, depending on your shell:

```
$ magctl ssh shell display
Active shell for current user: bash

$ magctl ssh shell display
Active shell for current user: magshell
```

The `_shell` commands work only when you are in magshell.

Step 2 If the preceding command output confirms that you are in magshell, and you then want to disable restricted shell, enter the following CLI command and password:

```
$ _shell -c 'sudo magctl ssh shell bash'
Password:
Warning! Activity within this shell can jeopardize the functioning of the system!
[sudo] password for maglev:
Successfully enabled bash for user, will be effective from next login.
```

Step 3 For the change to take effect, exit from the CLI session and then log back in to the CLI session.

Step 4 (Optional) To re-enable restricted shell, enter the following CLI command and password:

```
$ sudo magctl ssh shell magshell
[sudo] password for maglev:
Successfully enabled magshell for user, will be effective from next login.
```

Step 5 For the change to take effect, exit from the CLI session and then log back in to the CLI session.

About Product Usage Telemetry Collection

Telemetry data is collected by default in Cisco DNA Center, but you can opt out of some data collection. The data collection is designed to help the development of product features and address any operational issues, providing greater value and return on investment (ROI). Cisco collects the following categories of data: Cisco.com ID, System, Feature Usage, Network Device Inventory, and License Entitlement. See the *Cisco DNA Center Data Sheet* for a more expansive list of data that we collect. To opt out of some of data collection, contact your Cisco account representative and the Cisco Technical Assistance Center (TAC).

Click the menu icon (☰) and choose **System** > **Settings** > **Terms and Conditions** > **Telemetry Collection**. You can review the license agreement, the privacy statement, and the privacy data sheet from the **Telemetry Collection** window.

Configure vManage Properties

Cisco DNA Center supports Cisco's vEdge deployment by using integrated vManage setups. You can save the vManage details from the Settings page before provisioning any vEdge topologies.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **External Services** > **VManage**.

Step 2 Configure the vManage Properties:

- **Host Name/IP Address**: IP address of vManage.
- **Username**: Name that is used to log in to vManage.
- **Password**: Password that is used to log in to vManage.
- **Port Number**: Port that is used to log in to vManage.
- **vBond Host Name/IP Address**: IP address of vBond. Required if you are using vManage to manage NFV.
- **Organization Name**: Name of the organization. Required if you are using vManage to manage NFV.

Step 3 To upload the vManage certificate, click **Select a file from your computer**.

Step 4 Click **Save**.

Account Lockout

You can configure the account lockout policy to manage user login attempts, the account lockout period, and the number of login retries.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **Account Lockout**.

Step 2 Click the **Enforce Account Lockout** toggle button so that you see a check mark.

Step 3 Enter values for the following **Enforce Account Lockout** parameters:

- Maximum Login Retries
- Lockout Effective Periods (minutes)
- Reset Login Retries after (minutes)

Note Hover your cursor over **Info** to view details for each parameter.

Step 4 Choose the **Idle Session Timeout** value from the drop-down list.

Step 5 Click **Save**.

If you leave the session idle, a **Session Timeout** dialog box appears five minutes before the session timeout. Click **Stay signed in** if you want to continue the session. You can click **Sign out** to end the session immediately.

Password Expiry

You can configure the password expiration policy to manage the password expiration frequency, the number of days that users are notified before their password expires, and the grace period.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **Password Expiry**.

Step 2 Click the **Enforce Password Expiry** toggle button so that you see a check mark.

Step 3 Enter values for the following **Enforce Password Expiry** parameters:

- Password Expiry Period (days)
- Password Expiration Warning (days)
- Grace Period (days)

Note Hover over **Info** to view details for each parameter.

Step 4 Click **Save** to set the password expiry settings.

IP Access Control

IP access control allows you to control the access to Cisco DNA Center based on the IP address of the host or network. Cisco DNA Center provides the following options for IP access control:

- Allow all IP addresses to access Cisco DNA Center. By default, all IP addresses can access Cisco DNA Center.
- Allow only selected IP addresses to access Cisco DNA Center.

Configure IP Access Control

To configure IP access control and allow only selected IP addresses to access Cisco DNA Center, perform the following steps:

1. Enable IP Access Control, on page 90.
2. Add an IP Address to the IP Access List, on page 90.
3. (Optional) Delete an IP Address from the IP Access List, on page 91.

Enable IP Access Control

Before you begin

Ensure that you have SUPER-ADMIN-ROLE permissions.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **IP Access Control**.

Step 2 Click the **Allow only listed IP addresses to connect** radio button.

Step 3 Click **Add IP List**.

Step 4 In the **IP Address** field of the **Add IP** slide-in pane, enter your IPv4 address.

Note If you don't add your IP address to the IP access list, you may lose access to Cisco DNA Center.

Step 5 In the **Subnet Mask** field, enter the subnet mask.

The valid range for subnet mask is from 0 through 32.

Step 6 Click **Save**.

Add an IP Address to the IP Access List

To add more IP addresses to the IP access list, perform the following steps.

Before you begin

Ensure that you enable IP access control.

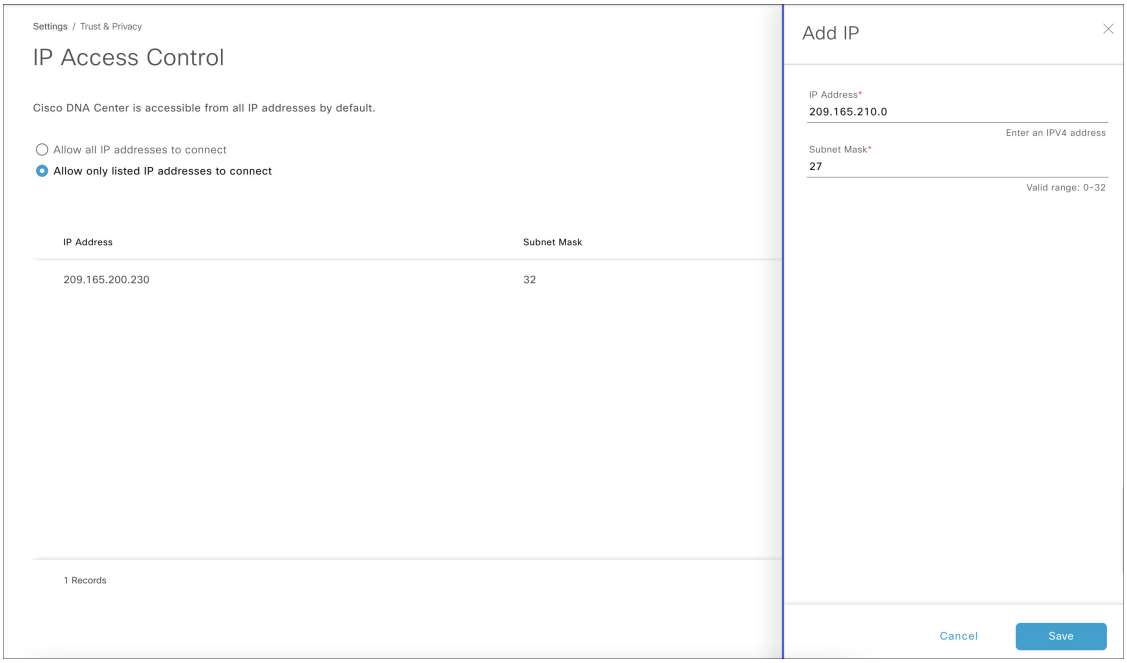
Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **IP Access Control**.

Step 2 Click **Add**.

Step 3 In the **IP Address** field of the **Add IP** slide-in pane, enter the IPv4 address of the host or network.

Step 4 In the **Subnet Mask** field, enter the subnet mask.

The valid range for subnet mask is from 0 through 32.



Step 5 Click **Save**.

Delete an IP Address from the IP Access List

The following section provides information about how to delete an IP address from the IP access list to disable its access to Cisco DNA Center.

Before you begin

Ensure that you have enabled IP access control and added IP addresses to the IP access list.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **IP Access Control**.

Step 2 In the **Action** column, click the **Delete** icon for the corresponding IP address.

Step 3 Click **Delete**.

Disable IP Access Control

The following section provides information about how to disable IP access control to allow all IP addresses to access Cisco DNA Center.

Before you begin

Ensure that you have SUPER-ADMIN-ROLE permissions.

Step 1 Click the menu icon (☰) and choose **System** > **Settings** > **Trust & Privacy** > **IP Access Control**.

Step 2 Click the **Allow all IP addresses to connect** radio button.