



Managing SSH Devices with Cisco Defense Orchestrator

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Managing SSH Devices with Cisco Defense Orchestrator

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Managing SSH Devices with Cisco Defense Orchestrator

Cisco Defense Orchestrator (CDO) allows you to manage devices through SSH. These are the features we support for those devices:

- [Onboard an SSH Device](#). You can use the username and password of a highly privileged user stored on the SSH device to onboard the device.
- [CDO Device and Service Management](#) You can view the device configuration file.
- [Read Changes from Cisco IOS or SSH to CDO](#). When you read the configuration file from the SSH device, it will be saved in CDO's database.
- [Out-of-Band Changes on Devices](#). When you enable Conflict Detection, CDO checks the device every 10 minutes for changes to the device's configuration. If there is a change, the device's status will change to Conflict Detected and you will be able to resolve the conflict.
- [CDO Command Line Interface](#). You can issue all SSH device commands to the device through CDO's command line interface.
- Individual CLI commands and groups of commands can be turned into editable and reusable "[Command Line Interface Macros](#)." You can use the system-defined macros provided by CDO and create your own macros for tasks you perform often.
- [Resolve New Fingerprint Detected State](#). If any credentials or properties of the device change, and that causes a change to the SSH fingerprint, CDO detects that change and gives you a chance to review and accept the new fingerprint.
- [Manage Change Logs in CDO](#). The change log captures all the commands you issue to the SSH device.



CHAPTER 1

Basics of Cisco Defense Orchestrator

Cisco Defense Orchestrator (CDO) provides a unique view of policy management through a clear and concise interface. Below are topics that cover the basics of using CDO for the first time.

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- [Use CDO Search Functionality, on page 85](#)
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Create a CDO Tenant

You can provision a new CDO tenant to onboard and manage your devices. If you use an On-Prem Firewall Management Center Version 7.2 and later, and want to integrate it with the Cisco Security Cloud, you can also create a CDO tenant as part of the integration workflow.

Procedure

1. Go to <https://www.defenseorchestrator.com/provision>.
2. Select the region where you want to provision your CDO tenant and click **Sign Up**.
3. On the **Security Cloud Sign On** page, provide your credentials.
4. If you do not have a Security Cloud Sign On account and want to create one, click **Sign up now**.
 - a. Provide the information you are prompted for, and click **Sign up**.

Clicking on **Sign up** triggers a mail to the e-mail ID you just provided, with a link to activate your account.

- b. Click **Activate account** both on the mail and the **Security Cloud Sign On** page.
- c. Configure multifactor authentication using Duo on a device of your choice and click **Log in with Duo** and **Finish**.



Note We recommend installing the Duo Security app on a mobile phone. Review [Duo Guide to Two Factor Authentication: Enrollment Guide](#) if you have questions about installing Duo.

5. Provide a name for your tenant and click **Create new account**.
6. A new CDO tenant is created in the region you have chosen; you will also receive an e-mail about your CDO tenant being created, with the details. If you are associated with multiple CDO tenants already, on the **Choose a tenant** page, select the tenant you just created to log in to it. If you have created a new CDO tenant for the first time, you get logged into your tenant directly.

For information about logging on to your CDO tenant for the first time, see [Initial Login to Your New CDO Tenant](#).

For information about managing a CDO tenant and various tenant settings, see [Tenant Management](#).

Upgrade your CDO tenant to full version

If you are using a free trial version of CDO, you will keep seeing the **You are in a free trial of CDO** banner, with the number of days left in the trial period. You can choose to upgrade your CDO tenant to full version any time during the trial period. Contact your Cisco sales representative or contact [Cisco Sales](#), and they can place an order on your behalf and get you the sales order number.

Once you obtain the sales order number, click **Upgrade to full version** on the banner and enter the order number to begin using the full version of CDO.

Request CDO trial period extension

If you want to continue using the trial version for 30 days, click **Request for an extension**.

Sign in to CDO

To log in to Cisco Defense Orchestrator (CDO), a customer needs an account with a SAML 2.0-compliant identity provider (IdP), a multi-factor authentication provider, and [Manage Users in CDO](#).

The IdP account contains the user's credentials and the IdP authenticates the user based on those credentials. Multi-factor authentication provides an added layer of identity security. The CDO user record primarily contains the username, the CDO tenant with which they are associated, and the user's role. When a user logs in, CDO tries to map the IdP's user ID to an existing user record on a tenant in CDO. The user is logged in to that tenant when CDO finds a match.

Unless your enterprise has its own single sign-on identity provider, your identity provider is Cisco Security Cloud Sign On. Cisco Security Cloud Sign On uses Duo for multi-factor authentication. Customers can [Integrate Your SAML Single Sign-On with Cisco Defense Orchestrator](#) if they choose.

To log into CDO, you must first create an account in Cisco Security Cloud Sign On, configure multi-factor authentication (MFA) using Duo Security and have your tenant Super Admin create a CDO record.

On October 14, 2019, CDO converted all previously-existing tenants to use Cisco Security Cloud Sign On as their identity provider and Duo for MFA.

**Note**

- If you sign in to CDO using your own single sign-on identity provider, the transition to Cisco Security Cloud Sign On did not affect you. You continue to use your own sign-on solution.
- If you are in the middle of a free trial of CDO, this transition did affect you.

If your CDO tenant was created on or after October 14, 2019, see [Initial Login to Your New CDO Tenant, on page 3](#).

If your CDO tenant existed before October 14, 2019, see [Migrate to Cisco Security Cloud Sign On Identity Provider, on page 4](#).

Initial Login to Your New CDO Tenant

Before You Begin



Install DUO Security. We recommend installing the Duo Security app on a mobile phone. Review [Duo Guide to Two Factor Authentication: Enrollment Guide](#) if you have questions about installing Duo.

Time Synchronization. You are going to use your mobile device to generate a one-time password. It is important that your device clock is synchronized with real time as the OTP is time-based. Make sure your device clock set automatically or manually set it to the correct time.

Cisco Defense Orchestrator (CDO) uses Cisco Security Cloud Sign On as its identity provider and Duo for multi-factor authentication (MFA). If you do not have a Cisco Security Cloud Sign On account, when you create a new CDO tenant using <https://www.defenseorchestrator.com/provision>, the provisioning flow involves various steps, including creating a Security Cloud Sign On account and configuring MFA using Duo.

MFA provides an added layer of security in protecting your user identity. Two-factor authentication, a type of MFA, requires two components, or factors, to ensure the identity of the user logging into CDO. The first factor is a username and password, and the second is a one-time password (OTP), which is generated on demand.



Important If your CDO tenant existed before October 14, 2019, use [Migrate to Cisco Security Cloud Sign On Identity Provider, on page 4](#) for log in instructions instead of this article.

What to do next?

Continue to, [Create a New Cisco Security Cloud Sign On Account and Configure Duo Multi-factor Authentication, on page 62](#). It is a four-step process. You need to complete all four steps.

Troubleshooting Login Failures

Login Fails Because You are Inadvertently Logging in to the Wrong CDO Region

Make sure you are logging into the appropriate CDO region. After you log into <https://sign-on.security.cisco.com>, you will be given a choice of what region to access. Click the **CDO** tile to access defenseorchestrator.com or **CDO (EU)** to access defenseorchestrator.eu.

Migrate to Cisco Security Cloud Sign On Identity Provider

On October 14, 2019, Cisco Defense Orchestrator(CDO) converted all tenants to Cisco Security Cloud Sign On as their identity provider and Duo for multi-factor authentication (MFA). **To log into CDO, you must first activate your account in Cisco Secure Sign-On and configure MFA using Duo.**

CDO requires MFA which provides an added layer of security in protecting your user identity. Two-factor authentication, a type of MFA, requires two components, or factors, to ensure the identity of the user logging into CDO. The first factor is a username and password, and the second is a one-time password (OTP), which is generated on demand.



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- Note**
- If you sign in to CDO using your own single sign-on identity provider, this transition to Cisco Security Cloud Sign On and Duo does not affect you. You continue to use your own sign-on solution.
 - If you are in the middle of a free trial of CDO, this transition does apply to you.
 - **If your CDO tenant was created on or after October 14, 2019**, see [Initial Login to Your New CDO Tenant, on page 3](#) for log in instructions instead of this article.
-

Before You Begin

We strongly recommend the following steps prior to migrating:

-  **Install DUO Security.** We recommend installing the Duo Security app on a mobile phone. Review [Duo Guide to Two Factor Authentication: Enrollment Guide](#) if you have questions about installing Duo.
- **Time Synchronization.** You are going to use your mobile device to generate a one-time password. It is important that your device clock is synchronized with real time as the OTP is time-based. Make sure your device clock set automatically or manually set it to the correct time.

- [Create a New Cisco Secure Sign-On Account and Configure Duo Multi-factor Authentication](#). It is a four-step process. You need to complete all four steps.

Troubleshooting Login Failures after Migration

Login to CDO Fails Because of Incorrect Username or Password

Solution If you try to log in to CDO and you *know* you are using the correct username and password and your login is failing, or you try "forgot password" cannot recover a viable password, you may have tried to login without creating a new Cisco Security Cloud Sign On account, you need to sign up for a new Cisco Security Cloud Sign On Account by following the instructions in [Create a New Cisco Security Cloud Sign On Account and Configure Duo Multi-factor Authentication, on page 62](#).

Login to the Cisco Security Cloud Sign On Dashboard Succeeds but You Can't Launch CDO

Solution You may have created a Cisco Security Cloud Sign On account with a different username than your CDO tenant. Contact the [Cisco Technical Assistance Center \(TAC\)](#) to standardize your user information between CDO and Cisco Secure Sign-On.

Login Fails Using a Saved Bookmark

Solution You may be attempting to log in using an old bookmark you saved in your browser. The bookmark could be pointing to <https://cdo.onelogin.com>.

Solution Log in to <https://sign-on.security.cisco.com>.

- **Solution** If you have not yet created a a Cisco Secure Sign-On account, [Create a New Cisco Security Cloud Sign On Account and Configure Duo Multi-factor Authentication](#).
- **Solution** If you have created your new account, click the CDO tile on the dashboard that corresponds to Cisco Defense Orchestrator(US), Cisco Defense Orchestrator (EU), or Cisco Defense Orchestrator (APJC)
- **Solution** Update your bookmark to point to <https://sign-on.security.cisco.com>.

Launch a CDO Tenant

Procedure

-
- Step 1** Click the appropriate CDO button on the Cisco Security Cloud Sign On dashboard. The CDO tile directs you to <https://defenseorchestrator.com>, the CDO (EU) tile directs you to <https://defenseorchestrator.eu>
- Step 2** Click the authenticator logo to choose Duo Security or Google Authenticator if you have set up both authenticators.
- If you already have a user record on an existing tenant, you are logged into that tenant.
 - If you already have a user record on several portals, you will be able to choose which portal to connect to.
 - If you already have a user record on several tenants, you will be able to choose which CDO tenant to connect to.

- If you do not already have a user record on an existing tenant, you will be able to learn more about CDO or request a trial tenant.

The **Portals** view retrieves and displays consolidated information from multiple tenants. See [Manage Multi-Tenant Portal, on page 52](#) for more information.

The **Tenant** view shows several tenants on which you have a user record.



Manage Super Admins on Your Tenant

It is a best practice to limit the number of Super Admins on your tenant. Determine which users should have Super Admin privileges, review [Manage Users in CDO](#), and change the roles of other users to "Admin."

About CDO Licenses

CDO requires a base subscription for tenant entitlement and device licenses for managing devices. You can buy one or more CDO base subscriptions based on the number of tenants you require and device licenses based on the device model number and the quantity. In other words, purchasing the base subscription gives you a CDO tenant, and for every device you choose to manage using CDO, you need separate device licenses. For the purposes of planning your deployment, note that each CDO tenant can manage approximately 500 devices through the Secure Device Connector (SDC) and any number of devices using the cloud connector. See [Secure Device Connector \(SDC\)](#) for more information.

To onboard and manage devices from Cisco Defense Orchestrator, you need to purchase a base subscription and device-specific, term-based subscriptions based on the devices you want to manage.

Subscriptions

Cisco Defense Orchestrator subscriptions are term-based:

- **Base** - Offers subscriptions for one, three, and five years, and provides entitlement to access the CDO tenant and onboard adequately licensed devices.
- **Device License** - Offers subscriptions for one, three, and five years for any supported device you choose to manage. For example, you can choose to manage a Cisco Firepower 1010 device using CDO for three years, if you purchase a three-year software subscription to the Cisco Firepower 1010 device.

See [Software and Hardware Supported by CDO](#) for more information on Cisco security devices that CDO supports.



Important You do not require two separate device licenses to manage a high availability device pair in CDO. If you have a high availability pair, purchasing one device license is sufficient, as CDO considers the pair of high availability devices as one single device.



Note You cannot manage CDO licensing through the Cisco smart licensing portal.

Software Subscription Support

The CDO base subscription includes software subscription support that is valid for the term of the subscription and provides access to software updates, major upgrades, and Cisco Technical Assistance Center (TAC), at no extra cost. While the software support is selected by default, you can also leverage the CDO solution support based on your requirement.

Cisco Defense Orchestrator Evaluation License

You can request for a 30-day Cisco Defense Orchestrator trial from your SecureX account. See [Request a CDO Tenant](#) for more information.

Cloud-Delivered Firewall Management Center and Threat Defense Licenses

You do not have to purchase a separate license to use the cloud-delivered Firewall Management Center in CDO; the base subscription for a CDO tenant includes the cost for the cloud-delivered Firewall Management Center.

Cloud-delivered Firewall Management Center Evaluation License

The cloud-delivered Firewall Management Center comes provisioned with a 90-day evaluation license, after which the threat defense services are blocked.

To learn how to get a cloud-delivered Firewall Management Center provisioned on your CDO tenant, see [Request a Cloud-delivered Firewall Management Center for your CDO Tenant](#).



Note The cloud-delivered Firewall Management Center does not support specific license reservation (SLR) for devices in air-gapped networks.

Threat Defense Licenses for Cloud-Delivered Firewall Management Center

You need individual licenses for each Secure Firewall Threat Defense device managed by the cloud-delivered Firewall Management Center. See [Licensing](#) in *Managing Firewall Threat Defense with Cloud-Delivered Firewall Management Center in Cisco Defense Orchestrator* for information.

To know how CDO handles licensing for the devices migrated to the cloud-delivered Firewall Management Center, see [Migrate Threat Defense from Management Center to Cloud](#).

Secure Device Connector

The Secure Device Connector (SDC) is an intelligent proxy that allows your Cisco devices to communicate with CDO. When onboarding a device that is not directly reachable over the internet to CDO using device credentials, you can deploy an SDC in your network to proxy communications between the devices and CDO. Alternatively, if you prefer, you can enable a device to receive direct communications through its outside interface from CDO. Adaptive Security Appliances (ASA), Meraki MXs, Secure Firewall Threat Defense devices, and Firepower Management Center devices, generic SSH and IOS devices, can all be onboarded to CDO using an SDC.

The SDC monitors CDO for commands that need to be executed on your managed devices, and messages that need to be sent to your managed devices. The SDC executes the commands on behalf of CDO, sends messages to CDO on behalf of the managed devices, and returns replies from the managed devices to CDO.

The SDC uses secure communication messages signed and encrypted using AES-128-GCM over HTTPS (TLS 1.2) to communicate with CDO. All credentials for onboarded devices and services are encrypted directly from the browser to the SDC as well as encrypted at rest using AES-128-GCM. Only the SDC has access to the device credentials. No other CDO service has access to the credentials. See [Connect Cisco Defense Orchestrator to your Managed Devices, on page 9](#) for information explaining how to allow communication between between an SDC and CDO.

The SDC may be installed on an appliance, as a virtual machine on a hypervisor, or in a cloud environment like AWS or Azure. You can install an SDC by using a combined virtual machine and SDC image provided by CDO, or you can create your own virtual machine and install the SDC on it. The SDC virtual appliance includes a CentOS or Ubuntu operating system and runs within a Docker container.

Each CDO tenant can have an unlimited number of SDCs. These SDCs are not shared between tenants, they are dedicated to a single tenant. The number of devices a single SDC can manage depends on the features implemented on those devices and the size of their configuration files. For the purposes of planning your deployment, however, expect one SDC to support approximately 500 devices.

Deploying more than one SDC for your tenant also provides these benefits:

- You can manage more devices with your CDO tenant without experiencing performance degradation.
- You can deploy an SDC to an isolated network segment within your network and still manage the devices in that segment with the same CDO tenant. Without multiple SDCs, you would need to manage the devices in those isolated network segments with different CDO tenants.

The procedure for deploying a second or subsequent SDC is the same for deploying your first SDC. The initial SDC on your tenant incorporates the name of your tenant and the number 1 and is displayed on the **Secure Connectors** tab in the **Services** page of CDO. Each additional SDC is numbered in order. See [Deploy a Secure Device Connector Using CDO's VM Image, on page 10](#) and [Deploy a Secure Device Connector on your own VM, on page 14](#)

Related Information:

- [Connect Cisco Defense Orchestrator to your Managed Devices](#)
- [Update your Secure Device Connector, on page 27](#)
- [Remove a Secure Device Connector, on page 25](#)

Connect Cisco Defense Orchestrator to your Managed Devices

CDO connects to the devices it manages through the cloud connector or through a Secure Device Connector (SDC).

If your device can be accessed directly from the internet you should be using the cloud connector to connect to your device. If you can, configure the device to allow inbound access on port 443 from the CDO IP addresses in your cloud region.

If your device is not accessible from the internet you can deploy an on-premises SDC in your network to allow CDO to communicate with your devices.

Configure the device to, allow full inbound access on port 443 (or whichever port you have configured for your device management).

You need an on-premises SDC in your network to onboard:

- A device with SSH access.

All other devices and services do not require an on-premise SDC. CDO will connect using its “cloud connector”. See the next section to know the IP addresses that must be allowed for inbound access.

Connecting Devices to CDO Through the Cloud Connector

When connecting CDO directly to your device through the cloud connector, you should allow inbound access on port 443 (or whichever port you have configured for your device management) for the various IP addresses in the EMEA, United States, or APJC region.

If you are a customer in **Europe, the Middle East, or Africa (EMEA)** region, and you connect to CDO at <https://defenseorchestrator.eu/>, allow inbound access from the following IP addresses:

- 35.157.12.126
- 35.157.12.15

If you are a customer in the **United States** region, and you connect to CDO at <https://defenseorchestrator.com>, allow inbound access from the following IP addresses:

- 52.34.234.2
- 52.36.70.147

If you are a customer in the **Asia-Pacific-Japan (APJ)** region, and you connect to CDO at <https://www.apj.cdo.cisco.com/>, allow inbound access from the following IP addresses:

- 54.199.195.111
- 52.199.243.0

Connecting CDO to SDC

When connecting CDO to your device through an SDC, the devices you want CDO to manage must allow full inbound access on port 443 (or whichever port you have configured for your device management). This is configured using a management access control rule.

You must also ensure that the virtual machine on which the SDC is deployed has network connectivity to the management interface of the managed device.

Deploy a Secure Device Connector Using CDO's VM Image

When using device credentials to connect CDO to a device, it is a best practice to download and deploy an SDC in your network to manage the communication between CDO and the device. Typically, these devices are non-perimeter based, do not have a public IP address, or have an open port to the outside interface. Adaptive Security Appliances (ASAs), FDM-managed devices, Firepower Management Centers (FMCs), and SSH and IOS devices, can all be onboarded to CDO using an SDC.

The SDC monitors CDO for commands that need to be executed on your managed devices, and messages that need to be sent to your managed devices. The SDC executes the commands on behalf of CDO, sends messages to CDO on behalf of the managed devices, and returns replies from the managed devices to CDO.

The number of devices a single SDC can manage depends on the features implemented on those devices and the size of their configuration files. For the purposes of planning your deployment, however, we expect one SDC to support approximately 500 devices. See [Using Multiple SDCs on a Single CDO Tenant, on page 27](#) for more information.

This procedure describes how to install an SDC in your network, using CDO's VM image. This is the preferred, easiest, and most reliable way to create an SDC. If you need to create the SDC using a VM that you create, follow [Deploy a Secure Device Connector on your own VM, on page 14](#).

Before you begin

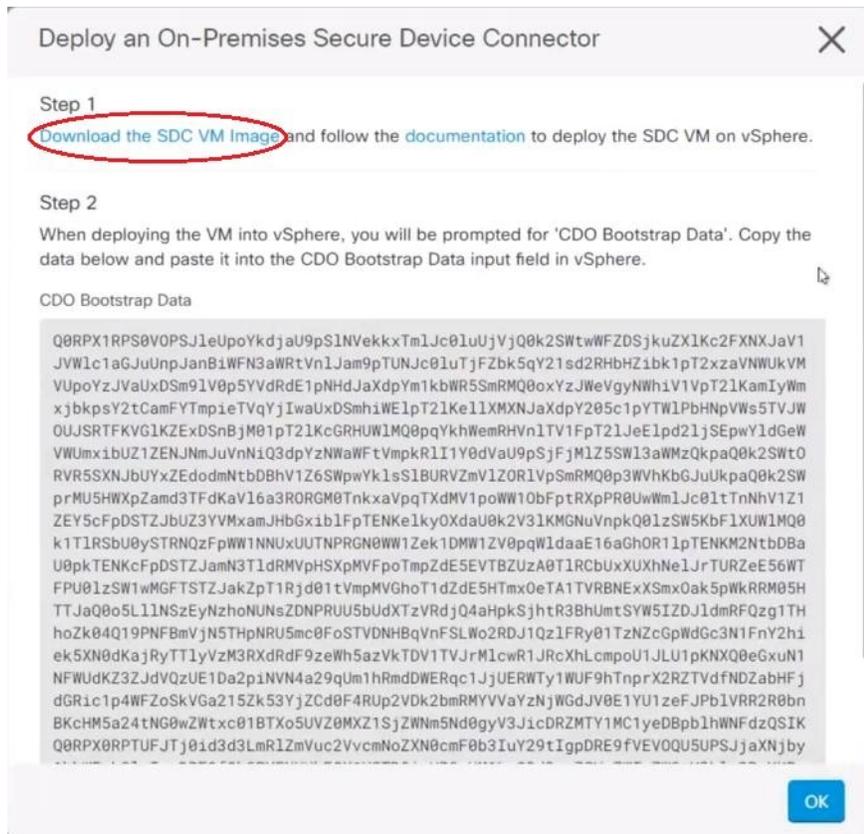
Review these prerequisites before you deploy the SDC:

- CDO requires strict certificate checking and does not support Web/Content Proxy inspection between the Secure Device Connector (SDC) and the Internet. If using a proxy server, disable inspection for traffic between the SDC and CDO.
- The SDC must have full outbound access to the internet on TCP port 443, or the port you have configured for device management. The devices managed by CDO must also allow inbound traffic from this port.
- Review [Connect Cisco Defense Orchestrator to your Managed Devices](#) to ensure proper network access.
- CDO supports installing its SDC VM OVF image using the vSphere web client or the ESXi web client.
- CDO does not support installing the SDC VM OVF image using the vSphere desktop client.
- ESXi 5.1 hypervisor.

- Cent OS 7 guest operating system.
- System requirements for a VMware ESXi host with only one SDC:
 - VMware ESXi host needs 2 CPU.
 - VMware ESXi host needs a minimum of 2 GB of memory.
 - VMware ESXi requires 64 GB disk space to support the virtual machine depending on your provisioning choice.
- The dockers IP must be in a different subnet than the SDC's IP range **and** the device IP range.
- Gather this information before you begin the installation:
 - Static IP address you want to use for your SDC.
 - Passwords for the `root` and `cdo` users that you create during the installation process.
 - The IP address of the DNS server your organization uses.
 - The gateway IP address of the network the SDC address is on.
 - The FQDN or IP address of your time server.
- The SDC virtual machine is configured to install security patches on a regular basis and in order to do this, opening port 80 outbound is required.

Procedure

- Step 1** Log on to the CDO Tenant you are creating the SDC for.
- Step 2** From the CDO menu, choose **Tools & Services > Secure Connectors**.
- Step 3** On the **Services** page, select the **Secure Connectors** tab, click the blue plus button, and select **Secure Device Connector**.
- Step 4** In Step 1, click **Download the SDC VM image**. This opens in a separate tab.



Step 5 Extract all the files from the .zip file. They will look similar to these:

- CDO-SDC-VM-ddd50fa.ovf
- CDO-SDC-VM-ddd50fa.mf
- CDO-SDC-VM-ddd50fa-disk1.vmdk

Step 6 Log on to your VMware server as an administrator using the vSphere Web Client.

Note Do not use the ESXi Web Client.

Step 7 Deploy the Secure Device Connector virtual machine from the OVF template by following the prompts.

Step 8 When the setup is complete, power on the SDC VM.

Step 9 Open the console for your new SDC VM.

Step 10 Login with the username **cd0**. The default password is **adm123**.

Step 11 At the prompt, type `sudo sdc-onboard setup`.

```
[cd0@localhost ~]$ sudo sdc-onboard setup
```

Step 12 When prompted for the password, enter `adm123`.

Step 13 Follow the prompts to create a new password for user `root`. Enter your password for the root user.

Step 14 Follow the prompts to create a new password for the **cd0** user. Enter your password for the `cd0` user

Deploy a Secure Device Connector on your own VM

When using device credentials to connect CDO to a device, it is a best practice to download and deploy a Secure Device Connector (SDC) in your network to manage the communication between CDO and the device. Typically, these devices are non-perimeter based, do not have a public IP address, or have an open port to the outside interface. Adaptive Security Appliances (ASAs), FDM-managed devices, and Firepower Management Centers (FMCs) devices can all be onboarded to CDO using device credentials.

The SDC monitors CDO for commands that need to be executed on your managed devices, and messages that need to be sent to your managed devices. The SDC executes the commands on behalf of CDO, sends messages to CDO on behalf of the managed devices, and returns replies from the managed devices to CDO.

The number of devices a single SDC can manage depends on the features implemented on those devices and the size of their configuration files. For the purposes of planning your deployment, however, we expect one SDC to support approximately 500 devices. See [Using Multiple SDCs on a Single CDO Tenant, on page 27](#) for more information.

This procedure describes how to install an SDC in your network by using your own virtual machine image.



Note The preferred, easiest, and most reliable way to install an SDC is to download CDO's SDC OVA image and install it. See [Deploy a Secure Device Connector Using CDO's VM Image, on page 10](#) for those instructions.

Before you begin

- CDO requires strict certificate checking and does not support a Web/Content Proxy between the SDC and the Internet.
- The SDC must have full outbound access to the Internet on TCP port 443 in order for it to communicate with CDO.
- Devices that reach CDO through the SDC must allow inbound access from the SDC on port 443.
- Review [Connect Cisco Defense Orchestrator to your Managed Devices](#) for networking guidelines.
- VMware ESXi host installed with vCenter web client or ESXi web client.



Note We do not support installation using the vSphere desktop client.

- ESXi 5.1 hypervisor.
- Cent OS 7 guest operating system.
- System requirements for a VM with only an SDC:
 - VMware ESXi host needs 2 CPUs.
 - VMware ESXi host needs a minimum of 2 GB of memory.
 - VMware ESXi requires 64 GB disk space to support the virtual machine depending on your provisioning choice. This value assumes you are using Logical Volume Management (LVM) with the partition so you can expand required disk space as needed.

- After you have updated the CPU and memory on the VM, power on the VM and ensure that the Secure Connectors page indicates that the SDC is in the "Active" state.
- Users performing this procedure should be comfortable working in a Linux environment and using the vi visual editor for editing files.
- If you are installing your on-premise SDC on a CentOS virtual machine, we recommend you install Yum security patches on a regular basis. Depending on your Yum configuration, to acquire Yum updates, you may need to open outbound access on port 80 as well as 443. You will also need to configure yum-cron or crontab to schedule the updates. Work with your security-operations team to determine if any security policies need to change to allow you to get the Yum updates.



Note **Before you get started:** Do not copy and paste the commands in the procedure into your terminal window, type them instead. Some commands include an "n-dash" and in the cut and paste process, these commands can be applied as an "m-dash" and that may cause the command to fail.

Procedure

- Step 1** Log on to the CDO tenant you are creating the SDC for.
- Step 2** From the CDO menu, choose **Tools & Services > Secure Connectors**.
- Step 3** On the **Services** page, select the **Secure Connectors** tab, click the blue plus button, and select **Secure Device Connector**.
- Step 4** Copy the bootstrap data in step 2 on the window to a notepad.
- Step 5** Install a **CentOS 7 virtual machine** with at least the following RAM and disk space allotted to the SDC:
- 8GB of RAM
 - 10GB disk space
- Step 6** Once installed, configure basic networking such as specifying the IP address for the SDC, the subnet mask, and gateway.
- Step 7** Configure a DNS (Domain Name Server) server.
- Step 8** Configure a NTP (Network Time Protocol) server.
- Step 9** Install an SSH server on CentOS for easy interaction with SDC's CLI.
- Step 10** Run a Yum update and then install the packages: **open-vm-tools**, **nettools**, and **bind-utils**
- ```
[root@sdc-vm ~]# yum update -y
[root@sdc-vm ~]# yum install -y open-vm-tools net-tools bind-utils
```
- Step 11** Install the AWS CLI package; see <https://docs.aws.amazon.com/cli/latest/userguide/awscli-install-linux.html>.
- Note** Do not use the **--user** flag.
- Step 12** Install the Docker CE packages; see <https://docs.docker.com/install/linux/docker-ce/centos/#install-docker-ce>
- Note** Use the "Install using the repository" method.
- Step 13** Start the Docker service and enable it to start on boot:

```
[root@sdc-vm ~]# systemctl start docker
[root@sdc-vm ~]# systemctl enable docker
Created symlink from /etc/systemd/system/multiuser.target.wants/docker.service to
/usr/lib/systemd/system/docker.service.
```

**Step 14** Create two users: "cdo" and "sdc." The cdo user will be the one you log in to run administrative functions (so you don't need to use the root user directly), and the sdc user will be the user to run the SDC docker container.

```
[root@sdc-vm ~]# useradd cdo
[root@sdc-vm ~]# useradd sdc -d /usr/local/cdo
```

**Step 15** Set a password for the cdo user.

```
[root@sdc-vm ~]# passwd cdo
Changing password for user cdo.
New password: <type password>
Retype new password: <type password>
passwd: all authentication tokens updated successfully.
```

**Step 16** Add the cdo user to the "wheel" group to give it administrative (sudo) privileges.

```
[root@sdc-vm ~]# usermod -aG wheel cdo
[root@sdc-vm ~]#
```

**Step 17** When Docker is installed, there is a user group created. Depending on the version of CentOS/Docker, this may be called either "docker" or "dockerroot". Check the /etc/group file to see which group was created, and then add the sdc user to this group.

```
[root@sdc-vm ~]# grep docker /etc/group
docker:x:993:
[root@sdc-vm ~]#
[root@sdc-vm ~]# usermod -aG docker sdc
[root@sdc-vm ~]#
```

**Step 18** If the /etc/docker/daemon.json file does not exist, create it, and populate with the contents below. Once created, restart the docker daemon.

**Note** Make sure that the group name entered in the "group" key matches the group you found in the /etc/group file the previous step.

```
[root@sdc-vm ~]# cat /etc/docker/daemon.json
{
 "live-restore": true,
 "group": "docker"
}
[root@sdc-vm ~]# systemctl restart docker
[root@sdc-vm ~]#
```

**Step 19** If you are currently using a vSphere console session, switch over to SSH and log in with the "cdo" user. Once logged in, change to the "sdc" user. When prompted for a password, enter the password for the "cdo" user.

```
[cdo@sdc-vm ~]$ sudo su sdc
[sudo] password for cdo: <type password for cdo user>
[sdc@sdc-vm ~]$
```

**Step 20** Change directories to /usr/local/cdo.

**Step 21** Create a new file called `bootstrapdata` and paste the bootstrap data from Step 2 of the **Deploy an On-Premises Secure Device Connector** wizard into this file. **Save** the file. You can use `vi` or `nano` to create the file.

**Step 22** The bootstrap data comes encoded in base64. Decode it and export it to a file called `extractedbootstrapdata`

```
[sdc@sdc-vm ~]$ base64 -d /usr/local/cdo/bootstrapdata > /usr/local/cdo/extractedbootstrapdata
```

```
[sdc@sdc-vm ~]$
```

Run the `cat` command to view the decoded data. The command and decoded data should look similar to this:

```
[sdc@sdc-vm ~]$ cat /usr/local/cdo/extractedbootstrapdata
CDO_TOKEN=<token string>
CDO_DOMAIN="www.defenseorchestrator.com"
CDO_TENANT=<tenant-name>
```

```
CDO_BOOTSTRAP_URL="https://www.defenseorchestrator.com/sdc/bootstrap/tenant-name/<tenant-name-SDC>"
```

**Step 23** Run the following command to export the sections of the decoded bootstrap data to environment variables.

```
[sdc@sdc-vm ~]$ sed -e 's/^/export /g' extractedbootstrapdata > sdcenv && source sdcenv
[sdc@sdc-vm ~]$
```

**Step 24** Download the bootstrap bundle from CDO.

```
[sdc@sdc-vm ~]$ curl -O -H "Authorization: Bearer $CDO_TOKEN" "$CDO_BOOTSTRAP_URL"
100 10314 100 10314 0 0 10656 0 --:--:-- --:--:-- --:--:-- 10654
[sdc@sdc-vm ~]$ ls -l /usr/local/cdo/*SDC
-rw-rw-r--. 1 sdc sdc 10314 Jul 23 13:48 /usr/local/cdo/tenant-name-SDC
```

**Step 25** Extract the SDC tarball, and run the `bootstrap.sh` file to install the SDC package.

```
[sdc@sdc-vm ~]$ tar xzvf /usr/local/cdo/tenant-name-SDC
<snipped - extracted files>
[sdc@sdc-vm ~]$
[sdc@sdc-vm ~]$ /usr/local/cdo/bootstrap/bootstrap.sh
[2018-07-23 13:54:02] environment properly configured
download: s3://onprem-sdc/toolkit/prod/toolkit.tar to toolkit/toolkit.tar
toolkit.sh
common.sh
[2018-07-23 13:54:04] startup new container
Unable to find image 'ciscodefenseorchestrator/sdc_prod:latest' locally
sha256:d98f17101db10e66db5b5d6afd1c95c29ea0004d9e4315508fd30579b275458:
Pulling from
ciscodefenseorchestrator/sdc_prod
08d48e6f1c9ff: Pull complete
ebbd10b629b1: Pull complete
d14d580ef2ed: Pull complete
45421d451ab8: Pull complete
<snipped - downloads>
no crontab for sdc
```

The SDC should now show "Active" in CDO.

---

## What to do next

-

# Deploy Secure Device Connector and Secure Event Connector on Ubuntu Virtual Machine

When using device credentials to connect CDO to a device, it is a best practice to download and deploy a Secure Device Connector (SDC) in your network to manage the communication between CDO and the device. Typically, these devices are non-perimeter based, do not have a public IP address, or have an open port to the outside interface. Adaptive Security Appliances (ASAs), FDM-managed devices, and Firepower Management Centers (FMCs) devices can all be onboarded to CDO using device credentials.

The SDC monitors CDO for commands that must be executed on your managed devices, and messages that must be sent to your managed devices. The SDC executes the commands on behalf of CDO, sends messages to CDO on behalf of the managed devices, and returns replies from the managed devices to CDO.

The Secure Event Connector (SEC) forwards events from ASA and FTD to the Cisco cloud so that you can view them on the Event Logging page and investigate them with Secure Cloud Analytics, depending on your licensing.

After deploying the SDC, adding an SEC container becomes a simple task. The SEC service is designed to receive syslog messages from ASA, Cisco IOS and FDM-managed devices, and send them securely to the Cisco cloud. This allows eventing services like CDO Analytics and Cisco XDR to store, augment, and analyze the log messages with ease.

You can execute the scripts that are provided on the [CiscoDevNet](#) site to install the SDC and SEC on Linux Ubuntu systems.

## Before you begin

- CDO requires strict certificate checking and does not support a Web/Content Proxy between the SDC and the Internet.
- The SDC must have full outbound access to the Internet on TCP port 443.
- Review [Connect Cisco Defense Orchestrator to your Managed Devices](#) for networking guidelines.
- VMware ESXi host that is installed with vCenter web client or ESXi web client.



---

**Note** We do not support installation using the vSphere desktop client.

---

- ESXi 5.1 hypervisor.
- Ubuntu operating system version 20.04 or above is installed on the virtual machine.

SDC:

- CPU: 2 Cores
- RAM: Minimum of 2 GB

SDC and SEC:

- CPU: 4 Cores
- RAM: Minimum of 8 GB

- The Ubuntu machine running the SDC must have network access to the management interfaces of the ASAs and Cisco IOS devices.

## Procedure

- 
- Step 1** Log on to the CDO tenant you are creating the SDC for.
- Step 2** Choose **Tools & Services > Secure Connectors**.
- Step 3** On the **Services** page, select the **Secure Connectors** tab, click the , and select **Secure Device Connector**.
- Step 4** Copy the bootstrap data in step 2 on the window to a notepad.
- Step 5** Open [CiscoDevNet to Deploy SDC](#).
- Step 6** Click **Code** and copy the URL in the **HTTPS** tab.
- Step 7** On the Ubuntu system, press Ctrl+Alt+T to quickly open the terminal window.
- Step 8** In the terminal, type **git** and paste the HTTPS URL copied earlier.
- ```
[sdc@vm]:~$ git https://github.com/CiscoDevNet/cdo-deploy-sdc.git
Resolving deltas: 100% (22/22). done.
```
- Step 9** Go to the "cdo-deploy-sdc" directory.
- ```
[sdc@vm]:~$ cd cdo-deploy-sdc.
```
- Step 10** Execute **ls -la** to see the files and scripts.
- **delete\_sdc.sh**: Deletes SDC previously installed on your system.
  - **deploy\_sdc.sh**: Deploys SDC on your system.
  - **install\_docker.sh**: Deploys the recommended version of docker on your system.
- Step 11** Run the script to install the docker.
- ```
[sdc@vm]:~/cdo-deploy-sdc$ ./install_docker.sh
Remove docker docker.io docker-compose docker-compose-v2 docker-doc podmand-docker {y/n} n
Active: active (running) since date time UTC; 32s ago
Adding the current user to the docker permissions group
Done!
```
- Step 12** Run the script to deploy SDC.
- Enter **./deploy_sdc.sh** and paste the bootstrap data that is copied from the CDO UI.
- ```
[sdc@vm]:~/cdo-deploy-sdc$./deploy_sdc.sh <bootstrap data>.
```
- If the docker container is up and running, the status of the SDC should go to 'Active' in the CDO Event Connectors panel.
- The Secure Device Connector must now show "Active" in CDO.
- 

## What to do next

-

# Deploy a Secure Device Connector to vSphere Using Terraform

## Before you begin

This procedure details how you can use the [CDO SDC Terraform module for vSphere](#) in conjunction with the [CDO Terraform Provider](#) to deploy an SDC to your vSphere. Ensure you review the following prerequisites before attempting to perform this task procedure:

- You require a vSphere datacenter version 7 and above
- You require an admin account on the datacenter with permissions to do the following:
  - Create VMs
  - Create folders
  - Create content libraries
  - Upload files to content libraries
- Terraform knowledge

## Procedure

**Step 1** Create an API-only user in CDO and copy the API token. To know how to create an API-only user, see [Create API Only Users](#).

**Step 2** Configure the CDO Terraform provider in your Terraform repository by following the instructions in [CDO Terraform Provider](#).

### Example:

```
terraform {
 required_providers {
 cdo = {
 source = "CiscoDevNet/cdo"
 version = "0.7.0"
 }
 }
}

provider "cdo" {
 base_url = "<the CDO URL you use to access CDO>"
 api_token = "<the API Token generated in step 1>"
}
```

**Step 3** Write Terraform code to create a `cdo_sdc` resource using the CDO Terraform provider. See the [Terraform registry for cdo-sdc resource](#) for more information.

### Example:

```
Resource "cdo_sdc" "my-sdc" {
 name = "my-sdc-in-vsphere"
}
```

The `bootstrap_data` attribute of this resource is populated with the value of the CDO bootstrap data and is provided to the `cdo_sdc` Terraform module in the next step.

**Step 4** Write Terraform code to create the SDC in vSphere using [cdo\\_sdc Terraform module](#).

**Example:**

```

data "cdo_tenant" "current" {}

module "vsphere-cdo-sdc" {
 source = "CiscoDevNet/cdo-sdc/vsphere"
 version = "1.0.0"
 vsphere_username = "<replace-with-username-with-admin-privileges>"
 vsphere_password = "<super-secure-password>"
 vsphere_server = "<replace-with-address-of-vsphere-server>"
 datacenter = "<replace-with-datacenter-name>"
 resource_pool = "<replace-with-resource-pool-name>"
 cdo_tenant_name = data.cdo_tenant.current.human_readable_name
 datastore = "<replace-with-name-of-datastore-to-deploy-vm-in>"
 network = "<replace-with-name-of-network-to-deploy-vm-in>"
 host = "<replace-with-esxi-host-address>"
 allow_unverified_ssl = <boolean; set to true if your vsphere server does not have a valid
 SSL certificate>
 ip_address = "<sdc-vm-ip-address; must be in the subnet of the assigned network
 for the VM>"
 gateway = "<replace-with-network-gateway-address>"
 cdo_user_password = "<replace-with-password-for-cdo-user-in-sdc-vm>"
 root_user_password = "<replace-with-password-for-root-user-in-sdc-vm>"
 cdo_bootstrap_data = cdo_sdc.sdc-in-vsphere.bootstrap_data
}

```

Note that the VM created has two users—a `root` user and a user called `cdo`—and the IP Address of the VM is configured statically. The `cdo_bootstrap_data` attribute is given the value of the `bootstrap_data` attribute generated when the `cdo_sdc` resource is created.

- Step 5** Plan and apply your Terraform using `terraform plan` and `terraform apply`, as you would normally. See the [CDO Automation Repository](#) in the CiscoDevNet for a complete example.

---

If your SDC stays in the onboarding state, connect to the vSphere VM using remote console, log in as the CDO user, and execute the following command:

```

sudo su
/opt/cdo/configure.sh startup

```




---

**Note** The CDO Terraform modules are published as Open Source Software under the Apache 2.0 license. You can file issues on GitHub if you require support.

---

## Deploy a Secure Device Connector on an AWS VPC Using a Terraform Module

### Before you begin

Review these prerequisites before attempting to deploy an SDC on your AWS VPC:

- CDO requires strict certificate checking and does not support Web/Content Proxy inspection between the SDC and the Internet. If using a proxy server, disable inspection for traffic between the Secure Device Connector (SDC) and CDO.
- Review [Connect Cisco Defense Orchestrator to your Managed Devices](#) to ensure proper network access.

- You require an AWS account, an AWS VPC with at least one subnet, and an AWS Route53-hosted zone.
- Ensure you have the CDO bootstrap data, your AWS VPC ID, and its subnet ID handy.
- Ensure that the private subnet to which you deploy the SDC has a NAT gateway attached.
- Open traffic on the port on which your firewall management HTTP interface is running, from your firewalls to the Elastic IP attached to the NAT gateway.

## Procedure

**Step 1** Add the following lines of code in your Terraform file; make sure you manually enter inputs for variables:

```
module "example-sdc" {
 source =
 "git::https://github.com/cisco-lockhart/terraform-aws-cdo-sdc.git?ref=v0.0.1"
 env = "example-env-ci"
 instance_name = "example-instance-name"
 instance_size = "r5a.xlarge"
 cdo_bootstrap_data = "<replace-with-cdo-bootstrap-data>"
 vpc_id = <replace-with-vpc-id>
 subnet_id = <replace-with-private-subnet-id>
}
```

See the [Secure Device Connector Terraform module](#) for a list of input variables and descriptions.

**Step 2** Register `instance_id` as an output in your Terraform code:

```
output "example_sdc_instance_id" {
 value = module.example-sdc.instance_id
}
```

You can use the `instance_id` to connect to the SDC instance for troubleshooting using the AWS Systems Manager Session Manager (SSM). See [Outputs](#) in the Secure Device Connector Terraform module for a list of available outputs.

## What to do next

For any troubleshooting of your SDC, you need to connect to the SDC instance using AWS SSM. See [AWS Systems Manager Session Manager](#) to know more about how to connect to your instance. Note that the ports to connect to the SDC instance using SSH are not exposed because of security reasons.



**Note** The CDO Terraform modules are published as Open Source Software under the Apache 2.0 license. You can file issues on GitHub if you require support.

## Configure a Secure Device Connector to Use Proxy

Using a proxy server can enhance security by acting as an intermediary that filters outbound traffic. It prevents direct exposure of your network devices to the internet and reduces the risk of attacks. A proxy server can be integrated with the Secure Device Connector (SDC) for all outbound communications from the SDC to CDO.

This procedure focuses on modifying the Docker container configuration specific to the SDC, not the host Linux OS settings.



**Note** The changes affect only the SDC's Docker container. Configure the proxy settings for the host Linux system according to your organization's standard procedures for Linux servers.

### Before you begin

- Familiarity with the Linux command-line interface (CLI) is required.
- We recommend creating a backup of your config.json file before editing it.

### Procedure

- 
- Step 1** Access the SDC using SSH and switch to the SDC user using this command:
- ```
$ sudo su - sdc
```
- Step 2** Navigate to the configuration file at `/usr/local/cdo/data/<your_sdc_name>/data/config.json`.
- Step 3** Insert the JSON key-value pair into the config.json file.
- Replace proxy with your proxy server's IP address or FQDN, and port with the proxy server's listening port.
- ```
"awsProxy": "https://proxy:port"
```
- Step 4** Save the changes and restart the SDC container. You can do this by either restarting the Docker container directly or by rebooting the virtual machine hosting the SDC.
- a) To restart the Docker container, first identify the SDC container ID using this command:
- ```
[sdc@localhost cdo] $ docker ps
```
- b) Restart the container using this command:
- ```
[sdc@localhost cdo] $ docker restart <container_id>
```
- where `<container_id>` is the ID of the SDC container.
- Step 5** Check the status using this command, and ensure that the SDC container has restarted successfully and is operational:
- ```
[sdc@localhost cdo] $ docker ps | grep sdc
```

Verify that the proxy settings are correct in the logs/lar.log file using this command:

```
[sdc@localhost cdo] $ less /usr/local/cdo/data/<your_sdc_name>/logs/lar.log
```

The SDC is successfully configured to communicate using the proxy server.

Change the IP Address of a Secure Device Connector

Before you begin

- You must be an admin to perform this task.
- The SDC must have full outbound access to the Internet on TCP port 443, or the port you have configured for device management.



Note You will not be required to re-onboard any devices to CDO after changing the SDC's IP address.

Procedure

- Step 1** Create an SSH connection to your SDC or open your virtual machine's console, and log in as the CDO user.
- Step 2** If you wish to view your SDC VM's network interface configuration information before changing the IP address, use the `ifconfig` command.
- ```
[cdo@localhost ~]$ ifconfig
```
- Step 3** To change the IP address of the interface, type `sudo sdc-onboard setup` command.
- ```
[cdo@localhost ~]$ sudo sdc-onboard setup
```
- Step 4** Enter your password at the prompt.
- ```
[sudo] password for cdo:
```
- Step 5** Type `n` at the prompt for resetting the root and CDO passwords.
- ```
Would you like to reset the root and cdo passwords? (y/n):
```
- Step 6** Type `y` at the prompt for reconfiguring the network.
- ```
Would you like to re-configure the network? (y/n):
```
- Step 7** Enter the new IP address you wish to assign to your SDC and the other domain information of the SDC VM when prompted:
- IP Address
  - Gateway
  - DNS Server
  - NTP Server or FQDN
 

or press enter if an NTP server or FQDN is not applicable.
  - Docker Bridge
 

or press enter if a docker bridge is not applicable.
- Step 8** Confirm your entries with `y` when prompted for the correctness of the values.
- ```
Are these values correct? (y/n):
```

Note Make sure your values are accurate before typing `y`, because your SSH connection to the old IP address will be lost after this command.

Step 9 Create an SSH connection using the new IP address you assigned to your SDC and log in.

Step 10 You can run the connectivity status test command to ensure that your SDC is up and running.

```
[cdo@localhost ~]$ sudo sdc-onboard status
```

All the checks must say [OK] in green.

Note If you are performing this procedure in the VM's console, once you confirm the values are correct, the connectivity status test is automatically run and the status shown.

Step 11 You can also check your SDC's connectivity through the CDO user interface. To do that, open the CDO application and navigate to **Tools & Services > Secure Connectors** page.

Step 12 Refresh the page once and select the secure connector whose IP address you changed.

Step 13 On the **Actions** pane, click **Request Heartbeat**.

You should see the **Hearbeat requested successfully** message, and the **Last Heartbeat** should display the current date and time.

Important The IP address change you made gets reflected on the SDC's **Details** pane only after 3:00 AM GMT.

See [Deploy a Secure Device Connector on your own VM, on page 14](#) for information on deploying an SDC on your VM.

Remove a Secure Device Connector



Warning

This procedure deletes your Secure Device Connector (SDC). It is not reversible. After taking this action, you will not be able to manage the devices connected to that SDC until you install a new SDC and reconnect your devices. Reconnecting your devices may requires you to re-enter the administrator credentials for each device you need to reconnect.

To remove the SDC from your tenant, follow this procedure:

Procedure

Step 1 Remove any devices connected to the SDC you want to delete.

- **a.** See [CDO Devices that Use the Same SDC](#) to identify all the devices used by the SDC.
- **b.** In the **Inventory** page, select all the devices you identified.
- **c.** In the Device Actions pane, click **Remove** and click **OK** to confirm your action.

Step 2 From the CDO menu, choose **Tools & Services > Secure Connectors**.

Step 3 On the **Services** page with the **Secure Connectors** tab selected, click the blue plus button and select **Secure Device Connector**.

Step 4 In the Secure Connectors table, select the SDC you want to remove. Its device count should now be zero.

Step 5 In the Actions pane, click  **Remove**. You receive this warning:

Warning You are about to delete <sdc_name>. Deleting the SDC is not reversible. Deleting the SDC will require you to create and onboard a new SDC before you can onboard, or re-onboard, your devices.

Because you currently have onboarded devices, removing the SDC will require you to reconnect those devices and provide credentials again after setting up a new SDC.

- If you have any questions or concerns, click **Cancel** and contact CDO support.
- If you wish to proceed, enter <sdc_name> in the text box below and click **OK**.

Step 6 In the confirmation dialog box, if you wish to proceed, enter your SDC's name as it is stated in the warning message.

Step 7 Click **OK** to confirm the SDC removal.

Move an ASA from one SDC to Another

CDO [Using Multiple SDCs on a Single CDO Tenant](#). You can move a managed ASA from one SDC to another using this procedure:

Procedure

Step 1 In the navigation bar, click **Inventory**.

Step 2 Click the **Devices** tab and then click the **ASA** tab.

Step 3 Select the ASA or ASAs you want to move to a different SDC.

Step 4 In the **Device Actions** pane, click **Update Credentials**.

Step 5 Click the Secure Device Connector button and select the SDC you want to move the device to.

Step 6 Enter the administrator username and password CDO uses to log into the device and click **Update**. Unless they were changed, the administrator username and password are the same credentials you used to onboard the ASA. You do not have to deploy these changes to the device.

Note If all the ASAs use the same credentials, you can move ASAs in bulk from one SDC to another. If the ASAs have different credentials, you have to move them from one SDC to another one at a time.

Rename a Secure Device Connector

Procedure

Step 1 From the CDO menu, choose **Tools & Services > Secure Connectors**.

Step 2 Select the SDC you want to rename.

- Step 3** In the Details pane, click the edit icon  next to the name of the SDC.
- Step 4** Rename the SDC.

This new name will appear wherever the SDC name appears in the CDO interface including the Secure Device Connectors filter of the **Inventory** pane.

Update your Secure Device Connector

Use this procedure as a troubleshooting tool. Ordinarily, the SDC is updated automatically and you should not have to use this procedure. However, if the time configuration on the VM is incorrect, the SDC cannot establish a connection to AWS to receive the updates. This procedure will initiate an update of the SDC and should resolve errors due to time synchronization problems.

Procedure

-
- Step 1** Connect to your SDC. (You can connect using SSH or use the console view in your VMware Hypervisor.)
- Step 2** Log in to the SDC as the **cdo** user.
- Step 3** Switch to the SDC user in order to update the SDC docker container:

```
[cdo@sdm-vm ~]$ sudo su sdc
[sudo] password for cdo: <type password for cdo user>
[sdc@sdm-vm ~]$
```

- Step 4** Upgrade the SDC toolkit:
- ```
[cdo@sdm-vm ~]$ /usr/local/cdo/toolkit/toolkit.sh upgradeToolkit
[sdc@sdm-vm ~]$
```

- Step 5** Upgrade the SDC:
- ```
[cdo@sdm-vm ~]$ /usr/local/cdo/toolkit/toolkit.sh upgradeSDC
[sdc@sdm-vm ~]$
```

Using Multiple SDCs on a Single CDO Tenant

Deploying more than one SDC for your tenant allows you to manage more devices without experiencing performance degradation. The number of devices a single SDC can manage depends on the features implemented on those devices and the size of their configuration files.

You can install an unlimited number of SDCs on a tenant. Each SDC could manage one network segment. These SDCs would connect the devices in those network segments to the same CDO tenant. Without multiple SDCs, you would need to manage the devices in isolated network segments with different CDO tenants.

The procedure for deploying a second or subsequent SDC is the same for deploying your first SDC. [Deploy a Secure Device Connector Using CDO's VM Image](#) or you can [Deploy a Secure Device Connector on your own VM](#). The initial SDC for your tenant incorporates the name of your tenant and the number 1. Each additional SDC is numbered in order.

CDO Devices that Use the Same SDC

Follow this procedure to identify all the devices that connect to CDO using the same SDC:

Procedure

-
- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab to locate the device.
 - Step 3** Click the appropriate device type tab.
 - Step 4** If there is any filter criteria already specified, click the **clear** button at the top of the Inventory table to show all the devices and services you manage with CDO.
 - Step 5** Click the filter button  to expand the **Filters** menu.
 - Step 6** In the Secure Device Connectors section of the filter, check the name of the SDC(s) you're interested in. The Inventory table displays only the devices that connect to CDO through the SDC you checked in the filter.
 - Step 7** (Optional) Check additional filters in the filter menu to refine your search further.
 - Step 8** (Optional) When you're done, click the **clear** button at the top of the Inventory table to show all devices and services you manage with CDO.
-

Open Source and Third-Party License in SDC

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Michael Bridgen <mikeb@squaremobius.net>

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*** async ***

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*** bluebird ***

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*** cheerio ***

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*** command-line-args ***

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* json-buffer *

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*** json-stable-stringify ***

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*** json-stringify-safe ***

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* log4js *

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* mkdirp *

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*** node-forge ***

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*** rimraf ***

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*** validator ***

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Devices, Software, and Hardware Supported by CDO

Cisco Defense Orchestrator (CDO) is a cloud-based management solution enabling the management of security policies and device configurations across multiple security platforms. CDO centrally manages policy and configuration across:

- Cisco Secure Firewall ASA, both on-premises and virtual
- Cisco Secure Firewall Threat Defense (FTD), both on-premises and virtual
- Cisco Secure Firewall Management Center, on-premises
- Cisco Meraki MX
- Cisco IOS devices
- Cisco Umbrella
- AWS Security Groups

The documentation describes devices, software, and hardware CDO supports. It does not point out software and devices that CDO does not support. If we do not explicitly claim support for a software version or a device type, then we do not support it.

Cisco Secure Firewall ASA

Cisco Adaptive Security Appliance (ASA) is a security device integrating firewall, VPN, and intrusion prevention capabilities. It protects networks from unauthorized access, cyber threats, and data breaches, offering robust security services in a single platform. CDO supports the management of ASA devices, offering features to streamline configuration management and ensure regulatory compliance across the network infrastructure.

Cisco Secure Firewall Threat Defense

Firewall Threat Defense integrates traditional firewall features with advanced threat protection capabilities. It offers comprehensive security functions, including intrusion prevention, application control, URL filtering, advanced malware protection, and so on. An FTD can be deployed on ASA hardware appliances, and Cisco firewall hardware appliances, and in virtual environments. Managing threat defense devices is possible through various management interfaces, such as Cisco Firewall Management Center, Cisco Defense Orchestrator, and Firewall Device Manager.

For more information on software and hardware compatibility, see the [Cisco Secure Firewall Threat Defense Compatibility Guide](#).

Firewall Device Manager is a web-based management interface explicitly designed for threat defense device management. It provides a simplified approach for configuring and monitoring threat defense devices, making it ideal for smaller-scale deployments or organizations preferring an intuitive interface.

FDM offers basic configuration capabilities for network settings, access control policies, NAT rules, VPN configuration, monitoring, and basic troubleshooting. Typically accessed through a web browser, FDM is directly available on the FTD device, eliminating the need for additional management servers or appliances.

Cisco Secure Firewall Management Center

CDO simplifies the management of on-premises Firewall Management Center by establishing a secure integration, discovering device inventories, and enabling centralized policy management. Security policies such as firewall rules, VPN settings, and intrusion prevention policies can be efficiently managed and deployed across all devices under FMC.

Cisco Meraki MX

The Meraki MX appliance is an enterprise-grade security and SD-WAN next-generation firewall appliance, designed for decentralized deployments. CDO supports managing layer 3 network rules on Meraki MX devices. When you onboard a Meraki device to CDO, it communicates with the Meraki dashboard to manage that device. CDO securely transfers configuration requests to the Meraki dashboard, which then applies the new configuration to the device. Key features of CDO's support for Cisco Meraki MX include centralized policy management, backup and restore, monitoring and reporting, compliance checking, and automation capabilities.

Cisco IOS Devices

Cisco IOS can manage and control network functions, including routing, switching, and other networking protocols. It offers a set of features and commands to configure and maintain Cisco network devices, enabling efficient communication and management within networks of varying sizes and complexities.

Cisco Umbrella

CDO manages Cisco Umbrella through integrations such as the Umbrella ASA Integration, which allows administrators to include their Cisco Adaptive Security Appliance (ASA) within their Umbrella configuration

using per-interface policies. This integration enables the ASA to redirect DNS queries to Umbrella, enhancing network security by leveraging Umbrella's DNS security, web filtering, and threat intelligence capabilities.

AWS Security Groups

CDO offers a simplified management interface for Amazon Web Services (AWS) Virtual Private Clouds (VPCs). Key features include monitoring AWS Site-to-Site VPN connections, tracking changes to AWS devices, and viewing AWS Site-to-Site VPN tunnels.

Browsers Supported in CDO

CDO supports the latest version of these browsers:

- Google Chrome
- Mozilla Firefox

CDO Platform Maintenance Schedule

CDO Maintenance Schedule

CDO updates its platform every week with new features and quality improvements. Updates can be made during a 3 hour period according to this schedule.

Table 1: CDO Maintenance Schedule

Day of the Week	Time of Day (24-hour time)
Thursday	09:00 UTC - 12:00 UTC

During this maintenance period, you can still access your tenant and if you have a cloud-delivered Firewall Management Center, you can access that platform as well. Additionally, the devices you have onboarded to CDO continue to enforce their security policies.



Note We advise you not to use CDO to deploy configuration changes on the devices it manages during maintenance periods.

If there is a failure that stops CDO or cloud-delivered Firewall Management Center from communicating, that failure is addressed on all affected tenants as quickly as possible even if it is outside the maintenance window.

Cloud-delivered Firewall Management Center Maintenance Schedule

Customers who have a cloud-delivered Firewall Management Center deployed on their tenant are notified approximately 1 week before CDO updates the cloud-delivered Firewall Management Center environment.

Super-admin and Admin users of the tenant are notified by email. CDO also displays a banner on its home page notifying all users of upcoming updates.

The update to your tenant may take up to 1 hour and occurs within the 3 hour maintenance period on the maintenance day assigned to your tenant's region. While your tenant is being updated, you will not be able to access the cloud-delivered Firewall Management Center environment, but you will still be able to access the rest of CDO.

Table 2: Cloud-delivered Firewall Management Center Maintenance Schedule

Day of the Week	Time of Day (24-hour time)	Region
Wednesday	04:00 UTC - 07:00 UTC	Europe, the Middle East, or Africa (EMEA)
Wednesday	17:00 UTC - 20:00 UTC	Asia-Pacific-Japan (APJ)
Thursday	09:00 UTC - 12:00 UTC	Americas

Manage a CDO Tenant

Cisco Defense Orchestrator (CDO) gives you the ability to customize certain aspects of your tenant and individual user accounts on the Settings page. From the CDO menu bar, click **Settings** in the left navigation panel.

General Settings

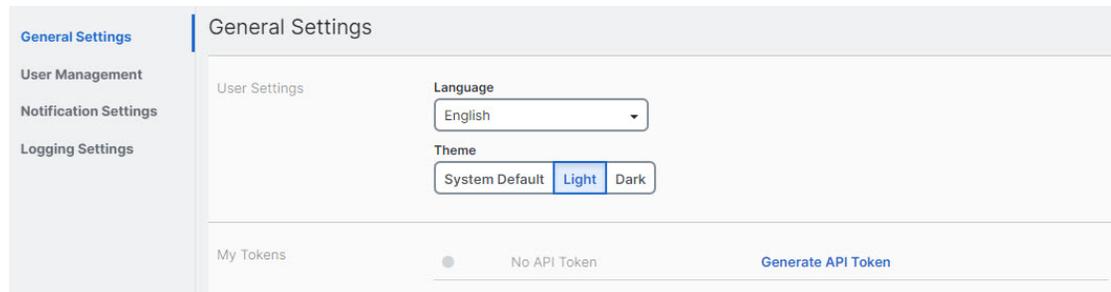
From the admin drop-down in the upper right, click **Settings**.

See the following topics regarding general CDO Settings:

- [User Settings, on page 41](#)
- For **My Tokens**, see [API Tokens, on page 49](#)
- For **Tenant Settings**, see:
 - [Enable Change Request Tracking, on page 41](#)
 - [Prevent Cisco Support from Viewing your Tenant, on page 41](#)
 - [Default Conflict Detection Interval, on page 42](#)
 - [Web Analytics, on page 43](#)
 - [Tenant ID, on page 43](#)
 - [Tenant Name, on page 43](#)

User Settings

Select the desired language and theme for the CDO UI to display in. This selection only affects the user who makes this change.



The screenshot displays the 'User Settings' interface. On the left, a sidebar lists 'General Settings', 'User Management', 'Notification Settings', and 'Logging Settings', with 'General Settings' highlighted. The main panel, titled 'General Settings', contains a 'User Settings' section. This section includes a 'Language' dropdown menu currently set to 'English' and a 'Theme' section with three buttons: 'System Default', 'Light' (which is selected), and 'Dark'. Below the 'User Settings' section is a 'My Tokens' section, which shows a radio button for 'No API Token' and a 'Generate API Token' button.

My Tokens

See [API Tokens](#) for more information.

Tenant Settings

Enable Change Request Tracking

Enabling change request tracking affects all users of your tenant. To enable Change Request Tracking, follow this procedure:

Procedure

- Step 1** From the admin drop-down in the upper right, click **Settings**.
- Step 2** Click the **General** tab.
- Step 3** Click the slider under **Change Request Tracking**.

Once confirmed, you see the Change Request toolbar appear in the lower left corner of the interface and the Change Request drop-down menu in the Change Log.

Prevent Cisco Support from Viewing your Tenant

Cisco support will associate its users with your tenant to resolve support tickets or proactively fix issues that affect more than one customer. However, if you prefer, you can prevent Cisco support from accessing your tenant by changing your account settings. To do so, slide the button under "Prevent Cisco support from viewing this tenant" to show a green check mark.

To prevent Cisco support from viewing your tenant, follow this procedure:

Procedure

- Step 1** From the admin drop-down in the upper right, click **Settings**.
- Step 2** Click the **General** tab.

Step 3 Click the slider under **Prevent Cisco support from viewing this tenant**.

Enable the Option to Auto-accept Device Changes

Enabling auto-accept for device changes allows Defense Orchestrator to automatically accept any changes made directly on the device. If you leave this option disabled, or disable it at a later time, you are required to review each device conflict before you can accept it.

To enable auto-accept for device changes, follow this procedure:

Procedure

- Step 1** From the admin drop-down in the upper right, click **Settings**.
 - Step 2** Click the **General** tab.
 - Step 3** Click the slider under **Enable the option to auto-accept device changes**.
-

Default Conflict Detection Interval

This interval determines how often CDO polls onboarded devices for changes. This selection affects all devices managed with this tenant, and can be changed at any time.



Note This selection can be overridden via the **Conflict Detection** option available from the **Inventory** page after you have selected one or multiple devices.

To configure this option and select a new interval for conflict detection, follow this procedure:

Procedure

- Step 1** From the admin drop-down in the upper right, click **Settings**.
 - Step 2** Click the **General Settings** tab.
 - Step 3** Click the drop-down menu for **Default Conflict Detection Interval** and select a time value.
-

Enable the Option to Schedule Automatic Deployments

Enabling the option to schedule automatic deployments allows you to schedule future deployments at a date and time when it is convenient. Once enabled, you can schedule a single or a recurring automatic deployment. To schedule an automatic deployment, see [Schedule an Automatic Deployment](#).

Note that changes made on CDO for a device are not automatically deployed to the device if it has pending changes of its own . If a device is not in the **Synced** state, such as **Conflict Detected** or **Not Synced**, scheduled deployments are not executed. The jobs page lists any instance where a scheduled deployment fails.

If **Enable the Option to Schedule Automatic Deployments** is turned off, all scheduled deployments are deleted.



Important If you use CDO to create more than one scheduled deployment for a device, the new deployment overwrites the existing deployment. If you create more than one scheduled deployment a device using API, you **must** delete the existing deployment prior to schedule the new deployment.

To enable the option to schedule automatic deployments, follow this procedure:

Procedure

- Step 1** From the admin drop-down in the upper right, click **Settings**.
 - Step 2** Click the **General Settings** tab.
 - Step 3** Click the slider under **Enable the option to schedule automatic deployments**.
-

Web Analytics

Web analytics provides anonymous product usage information to Cisco based on page hits. The information includes pages viewed, the time spent on a page, browser versions, product version, device hostname, and so forth. This information can help Cisco determine feature usage patterns and help Cisco improve the product. All usage data is anonymous and no sensitive data is transmitted.

Web analytics is enabled by default. To disable web analytics, or to enable in the future, follow this procedure:

Procedure

- Step 1** From the admin drop-down in the upper right, click **Settings**.
 - Step 2** Click the **General Settings** tab.
 - Step 3** Click the slider under **Web Analytics**.
-

Tenant ID

Your tenant ID identifies your tenant. This information will be helpful if you need to contact the Cisco Technical Assistance Center (TAC).

Tenant Name

Your tenant name also identifies your tenant. Note that the tenant name is not the organization name. This information will be helpful if you need to contact the Cisco Technical Assistance Center (TAC).

Tenant Notification Settings

Notifications are generated by CDO whenever a device associated with your tenant experiences a specific action, a device certificate is expiring or has expired, or a background log search starts, finishes or fails. While

these notifications are applied to all the devices associated with your tenant, not all device types support all of the available options. For example, background log search is only applicable for tenants who signed up for event logging.

From the navigation bar to the left, click **Settings > Notification Settings**.



Note You must have an **Super Admin** user role to change these settings. See [User Roles in CDO](#) for more information.

Email Subscribers

Add or modify the emails that receive alerts from your CDO tenant. See [Enable Email Subscribers, on page 44](#) for more information.

Service Integrations

Enable Incoming Webhooks on your messaging app and receive CDO notifications directly to your app dashboard. See [Enable Service Integrations for CDO Notifications](#) for more information.

Enable Email Subscribers

An email notification from CDO denotes the type of action and the affected devices. For further information about the current state of your devices and the content of the action, we recommend logging into CDO and examining the [Manage Change Logs in CDO](#) of the affected devices.



Warning Be sure to enter the correct email if you are adding a mailer. CDO does not check email addresses against known users associated with your tenant.

Add an Email Subscription

Before you begin

You must be an **Admin** to view the email subscription list, and a **SuperAdmin** to add, remove, or edit email subscriptions.

Procedure

-
- Step 1** Log into CDO and navigate to **Settings > Notification Settings**.
 - Step 2** Click the + icon in the upper right corner of the page.
 - Step 3** Enter a valid email address in the text field.
 - Step 4** Check and uncheck the appropriate checkboxes for events and alerts you want the subscriber to notified about.
 - Step 5** Click **Save**. At any point, click **Cancel** to creating the new email subscription for the tenant.
-

Edit Email Subscriptions

Before you begin

You must be an **Admin** to view the email subscription list, and a **SuperAdmin** to add, remove, or edit email subscriptions.

Procedure

- Step 1** Log into CDO and navigate to **Settings > Notification Settings**.
- Step 2** Locate the email address you want to enable to edit for email subscriptions.
- Step 3** Click the **Edit** icon.
- Step 4** Edit the following attributes:
- Email address
 - Send Alerts When.... Device Workflows
 - Send Alerts When... Device Events
 - Send Alerts When... Background Log Search
- Step 5** Click **Ok**. At any point, click **Cancel** to negate any changes made to the email subscription.
-

Delete an Email Subscription

Use the following procedure to delete a mailer from the email subscription list.:

Before you begin

You must be an **Admin** to view the email subscription list, and a **SuperAdmin** to add, remove, or edit email subscriptions.

Procedure

- Step 1** Log into CDO and navigate to **Settings > Notification Settings**.
- Step 2** Locate the user you want to remove from email subscriptions for the tenant.
- Step 3** Click the **Remove** icon for the user you want to remove.
- Step 4** Confirm you want to remove the user from the subscription list. Note that this does not affect the user functionality in any way.
-

Enable Service Integrations for CDO Notifications

Enable service integration to forward CDO notifications through a specified messaging application or service. You need to generate a webhook URL from your messaging application and point CDO to that webhook in CDO's **Notification Settings** page to receive notifications.

CDO natively supports Cisco Webex and Slack as service integrations. Messages sent to these services are specially formatted for channels and automated bots.



Note You must check the appropriate boxes for the notifications you want to receive per webhook.

Incoming Webhooks for Webex Teams

Before you begin

CDO notifications appear in a designated workspace or as an automated bot in a private message. For more information on how Webex Teams handles webhooks, see [Webex for Developers](#) for more information.

Use the following procedure to allow incoming webhooks for Webex Teams:

Procedure

- Step 1** Open the Webex Teams application.
 - Step 2** In the lower left corner of the window, click the **Apps** icon. This action opens the Cisco Webex App Hub in new tab in your preferred browser.
 - Step 3** Use the search bar to find **Incoming Webhooks**.
 - Step 4** Select **Connect**. This action opens an OAuth Authorization to allow the application in a new tab.
 - Step 5** Select **Accept**. The tab automatically redirects to the application's configuration page.
 - Step 6** Configure the following:
 - **Webhook name** - Provide a name to identify the messages provided by this application.
 - **Select a space** - Use the drop-down menu to choose a **Space**. The Space must already exist in Webex team. If a space does not exist, you can create a new space in Webex Teams and refresh the application's configuration page to display the new space.
 - Step 7** Select **Add**. The Webex Space you chose will receive a notification that the application is added.
 - Step 8** Copy the Webhook URL.
 - Step 9** Log into CDO.
 - Step 10** From the navigation bar to the left, click **Settings > Notification Settings**.
 - Step 11** Examine and confirm the notifications that are checked are correct. If they are not, we strongly recommend modifying the notification selection before you connect to a service integration.
 - Step 12** Scroll to **Service Integrations**.
 - Step 13** Click the blue plus button.
 - Step 14** Enter a **Name**. This name appears in CDO as a configured service integration. It does not appear in any events forwarded to the configured service.
 - Step 15** Expand the drop-down menu and select **Webex** as the Service Type.
 - Step 16** Paste the webhook URL that you generated from the service.
 - Step 17** Click **OK**.
-

Incoming Webhooks for Slack

CDO notifications appear in a designated channel or as an automated bot in a private message. For more information on how Slack handles incoming webhooks, see [Slack Apps](#) for more information.

Use the following procedure to allow incoming webhooks for Slack:

Procedure

- Step 1** Log into your Slack account.
 - Step 2** In the panel to the left, scroll to the bottom and select **Add Apps**.
 - Step 3** Search application directory for **Incoming Webhooks** and locate the app. Select **Add**.
 - Step 4** If you are not the admin of your Slack workspace, you must send a request to the admin of your org and wait for the app to be added to your account. Select **Request Configuration**. Enter an optional message and select **Submit Request**.
 - Step 5** Once the Incoming Webhooks app is enabled for your workspace, refresh the Slack settings page and select **Add New Webhook to Workspace**.
 - Step 6** Use the drop-down menu to select the Slack channel you want the CDO notifications to appear in. Select **Authorize**. If you navigate away from this page while waiting for the request to get enabled, simply log into Slack and select the workspace name in the upper left corner. From the drop-down menu, select **Customize Workspace** and select **Configure Apps**. Navigate to **Manage > Custom Integrations**. Select **Incoming Webhooks** to open app's landing page and then select **Configuration** from the tabs. This lists all the users within your workspace that has this app enabled. You can only see and edit your account's configuration. Select your workspace name to edit the configuration and move forward.
 - Step 7** The Slack settings page redirects you to the configuration page for the app. Locate and copy the webhook URL.
 - Step 8** Log into CDO.
 - Step 9** From the navigation bar to the left, click **Settings > Notification Settings**.
 - Step 10** Examine and confirm the notifications that are checked are correct. If they are not, we strongly recommend modifying the notification selection before you connect to a service integration.
 - Step 11** Scroll to **Service Integrations**.
 - Step 12** Click the blue plus button.
 - Step 13** Enter a **Name**. This name appears in CDO as a configured service integration. It does not appear in any events forwarded to the configured service.
 - Step 14** Expand the drop-down menu and select **Slack** as the Service Type.
 - Step 15** Paste the webhook URL that you generated from the service.
 - Step 16** Click OK.
-

Incoming Webhooks for a Custom Integration

Before you begin

CDO does not format messages for custom integration. If you opt to integrate a custom service or application, CDO sends a JSON message.

Refer to the service's documentation on how to enable incoming webhooks and generate a webhook URL. Once you have a webhook URL, use the procedure below to enable webhooks:

Procedure

- Step 1** Generate and copy the webhook URL from the custom service or application of your choice.
 - Step 2** Log into CDO.
 - Step 3** From the navigation bar to the left, click **Settings > Notification Settings**.
 - Step 4** Examine and confirm the notifications that are checked are correct. If they are not, we strongly recommend modifying the notification selection before you connect to a service integration.
 - Step 5** Scroll to **Service Integrations**.
 - Step 6** Click the blue plus button.
 - Step 7** Enter a **Name**. This name appears in CDO as a configured service integration. It does not appear in any events forwarded to the configured service.
 - Step 8** Expand the drop-down menu and select **Custom** as the Service Type.
 - Step 9** Paste the webhook URL that you generated from the service.
 - Step 10** Click OK.
-

Logging Settings

View your monthly event logging limit and how many days are left until the limit resets. Note that stored logging represents the compressed event data that the Cisco cloud received.

Click **View Historical Usage** to see all of the logging your tenant has received over the past 12 months.

There are also links you can use to request additional storage.

Integrate Your SAML Single Sign-On with Cisco Defense Orchestrator

Cisco Defense Orchestrator (CDO) uses Cisco Secure Sign-On as its SAML single sign-on identity provider (IdP) and Duo Security for multifactor authentication (MFA). This is CDO's preferred authentication method.

If, however, customers want to integrate their own SAML single sign-on IdP solution with CDO, they can as long as their IdP supports SAML 2.0 and identity provider-initiated workflow.

To integrate your own or third-party identity provider (IdP) with Cisco Security Cloud Sign On, see [Cisco Security Cloud Sign On Identity Provider Integration Guide](#).

If you need more support to integrate your own SAML solution with CDO, contact support and [create a case](#).



Attention When you open a case, ensure that you choose **Manually Select A Technology** and select **SecureX - Sign-on and Administration** for your request to reach the right team.

Renew SSO Certificate

Your Identity Provider (IdP) is usually integrated with SecureX SSO. Open a [Cisco TAC](#) case and provide the metadata.xml file. For more information, see [Cisco SecureX Sign-On Third-Party Identity Provider Integration Guide](#).



Attention When you open a case, ensure that you choose **Manually Select A Technology** and select **SecureX - Sign-on and Administration** for your request to reach the right team.

(legacy only) If your Identity Provider (IdP) integration is directly with CDO, open a [How CDO Customers Open a Support Ticket with TAC](#) and provide the metadata.xml file.

API Tokens

Developers use CDO API tokens when making CDO REST API calls. The API token must be inserted in the REST API authorization header for a call to succeed. API tokens are "long-lived" access tokens which do not expire; however, you can renew and revoke them.

You can generate API tokens from within CDO. These tokens are only visible immediately after they're generated and for as long as the General Settings page is open. If you open a different page in CDO and return to the **General Settings** page, the token is no longer visible, although it is clear that a token has been issued.

Individual users can create their own tokens for a particular tenant. One user cannot generate a token on behalf of another. Tokens are specific to an account-tenant pair and cannot be used for other user-tenant combinations.

API Token Format and Claims

The API token is a JSON Web Token (JWT). To learn more about the JWT token format, read the [Introduction to JSON Web Tokens](#).

The CDO API token provides the following set of claims:

- **id** - user/device uid
- **parentId** - tenant uid
- **ver** - the version of the public key (initial version is 0, for example, **cdo_jwt_sig_pub_key.0**)
- **subscriptions** - Security Services Exchange subscriptions (optional)
- **client_id** - "api-client"
- **jti** - token id

Token Management

Generate an API Token

Procedure

- Step 1** From the navigation bar to the left, click **Settings > General Settings**.

- Step 2** In My Tokens, click **Generate API Token**.
- Step 3** Save the token in a secure location in accordance with your enterprise's best practices for maintaining sensitive data.
-

Renew an API Token

The API token does not expire. However, users may choose to renew their API token if the token is lost, compromised, or to conform to their enterprise's security guidelines.

Procedure

- Step 1** From the navigation bar to the left, click **Settings > General Settings**.
- Step 2** In My Tokens, click **Renew**. CDO generates a *new* token.
- Step 3** Save the new token in a secure location in accordance with your enterprise's best practices for maintaining sensitive data.
-

Revoke an API Token

Procedure

- Step 1** From navigation bar to the left, click **Settings > General Settings**.
- Step 2** In My Tokens, click **Revoke**. CDO revokes the token.
-

Relationship Between the Identity Provider Accounts and Cisco Defense Orchestrator User Records

To log in to Cisco Defense Orchestrator (CDO), a customer needs an account with a SAML 2.0-compliant identity provider (IdP), a multi-factor authentication provider, and a user record in CDO. The IdP account contains the user's credentials and the IdP authenticates the user based on those credentials. Multi-factor authentication provides an added layer of identity security. The CDO user record primarily contains the username, the CDO tenant with which they are associated, and the user's role. When a user logs in, CDO tries to map the IdP's user ID to an existing user record on a tenant in CDO. When CDO finds a match, the user is logged in to that tenant.

Unless your enterprise has its own single sign-on identity provider, your identity provider is Cisco Security Cloud Sign On. Cisco Security Cloud Sign On uses Duo for multi-factor authentication. Customers can [Integrate Your SAML Single Sign-On with Cisco Defense Orchestrator](#) if they choose.

Login Workflow

This is a simplified description of how the IdP account interacts with the CDO user record to log in a CDO user:

Procedure

- Step 1** The user requests access to CDO by logging in to a SAML 2.0-compliant identity provider (IdP) such as Cisco Security Cloud Sign On (<https://sign-on.security.cisco.com>) for authentication.
- Step 2** The IdP issues a SAML assertion that the user is authentic and a portal displays the applications the user can access such as tiles representing <https://defenseorchestrator.com> or <https://defenseorchestrator.eu> or <https://www.apj.cdo.cisco.com/>.
- Step 3** CDO validates the SAML assertion, extracts the username and attempts to find a user record among its tenants that corresponding to that username.
- If the user has a user record on a single tenant on CDO, CDO grants the user access to the tenant and the user's role determines the actions they can take.
 - If the user has a user record on more than one tenant, CDO presents the authenticated user with a list of tenants they can choose from. The user picks a tenant and is allowed to access the tenant. The user's role on that specific tenant determines the actions they can take.
 - If CDO does not have a mapping for the authenticated user to a user record on a tenant, CDO displays a landing page giving users the opportunity to learn more about CDO or request a free trial.

Creating a user record in CDO does not create an account in the IdP and creating an account in the IdP does not create a user record in CDO.

Similarly, deleting an account on the IdP does not mean you have deleted the user record from CDO; although, without the IdP account, there is no way to authenticate a user to CDO. Deleting the CDO user record does not mean you have deleted the IdP account; although, without the CDO user record, there will be no way for an authenticated user to access a CDO tenant.

Implications of this Architecture

Customers Who Use Cisco Security Cloud Sign On

For customers who use CDO's Cisco Security Cloud Sign On identity provider, a Super Admin can create a user record in CDO and a user can self-register themselves with CDO. If the two usernames match, and the user is properly authenticated, the user can log in to CDO.

Should the Super Admin ever need to prevent a user from accessing CDO, they can simply delete the CDO user's user record. The Cisco Security Cloud Sign On account will still exist and if the Super Admin ever wants to restore the user, they can by creating a new CDO user record with the same username as the one used for Cisco Security Cloud Sign On.

Should a customer ever run into a problem with CDO that requires a call to our Technical Assistance Center (TAC), the customer could create a user record for the TAC engineer so they could investigate the tenant and report back to the customer with information and suggestions.

Customers Who Have Their Own Identity Provider

For [Integrate Your SAML Single Sign-On with Cisco Defense Orchestrator](#), they control both the identity provider accounts and the CDO tenants. These customers can create and manage identity provider accounts and user records in CDO.

Should they ever need to prevent a user from accessing CDO, they can delete the IdP account, the CDO user record, or both.

If they ever need help from Cisco TAC, they can create both the identity provider account and a CDO user record, with a read-only role, for their TAC engineer. The TAC engineer would then be able to access the customer's CDO tenant, investigate, and report back the customer with information and suggestions.

Cisco Managed Service Providers

If Cisco Managed Service Providers (MSPs) use CDO's Cisco Security Cloud Sign On IdP, they can self-register for Cisco Security Cloud Sign On and their customers can create a user record for them in CDO so that the MSP can manage the customer's tenant. Of course, the customer has full control to delete the MSP's record when they choose to.

Related Topics

- [General Settings](#)
- [Manage Users in CDO](#)
- [User Roles in CDO](#)

Manage Multi-Tenant Portal

CDO Multi-Tenant Portal view retrieves and displays information from all devices across multiple tenants. This multi-tenant portal shows the device status, software versions running on them, and many more.



Note From the multi-tenant portal, you can add tenants across multiple regions and view devices those tenants manage. You cannot edit any tenants or configure any devices from the multi-tenant portal.

Before you begin

The multi-tenant portal is only available if the feature is enabled on your tenant. To enable multi-tenant portal for your tenant, open a support ticket with Cisco TAC. Once the support ticket is resolved and the portal is created, users with the **Super Admin** role on the portal have the ability to add tenants to it.

We recommend you clearing cache and cookies from your web browser to avoid certain browser-related issues that may occur.

The Multi-Tenant Portal

The portal provides the following menus:

- **Devices:**
 - Displays all the devices residing in the tenants added to the portal. Use the **Filter** and **Search** field to search devices that you want to view. You can click a device to view its status, the onboarding method, firewall mode, failover mode, software version, and many more.
 - The interface provides a column picker  that allows you to select or clear the device properties to view in the table. Except for 'AnyConnect Remote Access VPN', all the other device properties

are selected by default. If you customize the table, CDO remembers your selection the next time you sign in to CDO.

- You can click on a device to see its details on the right.
- You can export  the portal's information to a comma-separated value (.csv) file. This information helps you to analyze the devices or send it to someone who doesn't have access. Every time you export the data, CDO creates a new .csv file, where the file created has a date and time in its name.
- You can manage a device only from the CDO tenant that manages it. The multi-tenant portal provides the **Manage devices** link that directs you to the CDO tenant page. You'll see this link on the device if you have an account on that tenant, and the tenant is in the same region as the portal. If you don't have permission to access the tenant, you'll not see the Manage Devices link. You can contact a super-admin in your organization for permission.



Note If the tenant managing the device is in a different region, you'll see the link to sign in to CDO in that region. If you don't have access to CDO in that region or the tenant in that region, you'll not be able to manage the device.

The screenshot shows the 'All Devices & Services' page in the Cisco Defense Orchestrator. A table lists several devices with columns for Name, Type, Region, Version, Hardware Version, Configuration, and Connectivity State. The first device, 52.53.207.153, is highlighted. To the right, a 'Device Details' panel shows information for this device, including its location (Europe), model (ASA), and a warning: 'Device in Different Region'. The warning states: 'The device 52.53.207.153 is managed by a Cisco Defense Orchestrator tenant in a different region. To manage this device, sign in to CDO in Europe.'

Name	Type	Region	Version	Hardware Version	Configuration	Connectivity State
52.53.207.153	ASA	Europe	9.8(3)18	ASAv (V01)	Synced	Online
Acton	Unknown	North America	16.03.07	CSR1000V	Synced	Online
Amsterdam	ASA	North America	9.13(1)7	ASAv (V01)	Synced	Online
Ayer	FTD	North America	6.4.0-44	Cisco Firepower Threat Defe	Synced	Online
Baltimore	ASA	North America	9.9(2)	ASAv (V01)	Synced	Online
Burak-crush-APUC	ASA Model	Asia-Pacific & Japan	9.1(5)		Synced	Online

- **Tenants:**
 - Displays the tenants added to the portal.
 - It allows a Super Admin user to add tenants to the portal.
 - You can click  to view the CDO tenant's main page.

Add a Tenant to a Multi-Tenant Portal

A user with the Super Admin role can add tenants to the portal. You can add tenants across multiple regions. For example, you can add a tenant from the Europe region into the US region and conversely.



Important We recommend that you [Create API Only Users](#) for your tenant and generate an API token for authenticating to CDO.



Note If you want to add multiple tenants to the portal, generate API tokens from each tenant and paste them into a text file. You can then easily add the tenants one after another to the portal without switching to the tenant every time to generate a token.

Procedure

- Step 1** From the navigation bar to the left, click **Settings** > **General Settings** > **My Tokens**.
 - Step 2** Click **Generate API Token** and then copy it.
 - Step 3** Go to the portal and click the **Tenants** tab.
 - Step 4** Click  add the tenant button on the right.
 - Step 5** Paste the token and click **Save**.
-

Delete a Tenant from a Multi-Tenant Portal

Procedure

- Step 1** Go to the portal and click the **Tenants** tab.
 - Step 2** Click the corresponding delete icon appearing on the right to remove the tenant that you want.
 - Step 3** Click **Remove**. The associated devices are also removed from the portal.
-

Manage-Tenant Portal Settings

Cisco Defense Orchestrator (Defense Orchestrator) gives you the ability to customize certain aspects of your Multi-Tenant Portal and individual user accounts on the Settings page. Access the settings page by clicking **Settings** in the navigation bar to the left.

Settings

General Settings

Web analytics provides anonymous product usage information to Cisco based on page hits. The information includes pages viewed, the time spent on a page, browser versions, product version, device hostname, and so forth. This information can help Cisco determine feature usage patterns and help Cisco improve the product. All usage data is anonymous, and no sensitive data is transmitted.

Web analytics is enabled by default. To disable web analytics or to enable in the future, follow this procedure:

1. From the CDO dashboard, click **Settings** in the navigation bar to the left.
2. Click **General Settings**.
3. Click the slider under **Web Analytics**.

User Management

You can see all the user records associated with the Multi-Tenant Portal on the **User Management** screen. You can add, edit, or delete a user account. For more information, see [Manage Users in CDO](#).

Switch Tenant

If you have more than one portal tenants, you can switch between different portal or tenants without signing out from CDO.

Procedure

- Step 1** On the multi-tenant portal, click your tenant menu appearing on the top right corner.
 - Step 2** Click **Switch tenant**.
 - Step 3** Choose the portal or tenant that you want to view.
-

The Cisco Success Network

Cisco Success Network is a user-enabled cloud service. When you enable Cisco Success Network, a secure connection is established between the device and the Cisco cloud to stream usage information and statistics. Streaming telemetry provides a mechanism to select data of interest from the device and to transmit it in a structured format to remote management stations for the following benefits:

- To inform you of available unused features that can improve the effectiveness of the product in your network.
- To inform you of additional technical support services and monitoring that might be available for your product.
- To help Cisco improve our products.

The device establishes and maintains the secure connection at all times, and allows you to enroll in the Cisco Success Network. After you have registered the device, you can change the Cisco Success Network setting.



-
- Note**
- For threat defense high availability pairs, the selection of the active device overrides the Cisco Success Network setting on the standby device.
 - CDO does not manage the Cisco Success Network settings. The settings managed through, and telemetry information is provided by, the Firewall Device Manager user interface.
-

Enable or Disable the Cisco Success Network

During initial system setup, you are prompted to register the device with Cisco Smart Software Manager. If you instead elected to use the 90-day evaluation license, you must register the device before the end of the evaluation period. To enroll the device, either register the device with Cisco Smart Software Manager (on the Smart Licensing page) or enroll with CDO by entering a registration key.

When you register the device, your virtual account allocates the license to the device. Registering the device also registers any optional licenses that you have enabled.

You can turn off this connection at any time by disabling Cisco Success Network, although you can only disable this option through the Firewall Device Manager UI. Disabling will disconnect the device from the cloud. Disconnection does not impact the receipt of updates or the operation of the Smart Licensing capabilities, which continue to operate normally. See the **Connecting to the Cisco Success Network** section of the System Administration chapter of the [Firepower Device Manager configuration Guide](#), Version 6.4.0 or later for more information.

Manage Users in CDO

Before you create or edit a user record in CDO, read [Relationship Between the Identity Provider Accounts and Cisco Defense Orchestrator User Records](#) to learn how the identity provider (IdP) account and the user record interact. CDO users need a CDO record and a corresponding IdP account so they can be authenticated and access your CDO tenant.

Unless your enterprise has its own IdP, Cisco Secure Sign-On is the identity provider for all CDO tenants. The rest of this article assumes you are using Cisco Secure Sign-On as your identity provider.

You can see all the user records associated with your tenant on the **User Management** screen. This includes any Cisco support engineer temporarily associated with your account to resolve a support ticket.

View the User Records Associated with your Tenant

Procedure

From the CDO navigation bar, click **Settings > User Management**.

Note To prevent Cisco support from accessing your tenant, configure your Account Settings in the [General Settings](#) page.

Active Directory Groups in User Management

For tenants that have a high turnover for large quantities of users, you can map CDO to your Active Directory (AD) groups instead of adding individual users to CDO for an easier way to manage your user lists and user roles. Any user changes, such as a new user addition or removing existing user(s), can now be done in Active Directory and no longer need to be done in CDO.

You must have a **SuperAdmin** user role to add, edit, or delete an AD group from the User Management page. See [User Roles in CDO](#) for more information.

Active Directory Groups Tab

The User Management section of the **Settings** page has a tab for Active Directory Groups that are currently mapped to CDO. Most importantly, this page displays the role of the AD group as assigned in your AD manager.

Users within an AD group are not listed individually in either the Active Directory Groups tab or the Users tab.

Audit Logs Tab

The User Management section of the **Settings** page has a tab for Audit Logs. This new section shows the last time of login of all users who accessed a CDO tenant, and the role(s) each user held at the time of last login. This includes both explicit user logins and AD group logins.

Multi-role Users

As an extension along the IAM capabilities in CDO, it is now possible for a user to have multiple roles.

A user can be part of multiple groups in AD, and each of those groups can be defined in CDO with different CDO roles. The final permissions a user gets on login are a combination of the roles of all the AD groups defined in CDO that the user is part of. For instance, if a user is part of two AD groups and both the groups are added in CDO with two different roles such as edit-only and deploy-only, the user would have both edit-only and deploy-only permissions. This applies to any number of groups and roles.

AD group mappings only need to be defined once in CDO, and managing access and permissions for users can subsequently be achieved exclusively in AD by adding, removing, or moving users between different groups.



Note If a user is both an individual user and part of an AD group on the same tenant, the user role of the individual user overrides the user role of the AD group.

Before You Begin

Prior to adding an AD group mapping to CDO as a form of user management, you must have your AD integrated with SecureX. If your AD Identity Provider (IdP) is not already integrated, open a [Support Case](#) with Cisco TAC and request a custom AD IdP integration with the following information:

- Your CDO tenant name and region
- Domain to define custom routing for (for example : @cisco.com, @myenterprise.com)
- Certificate and federation metadata in .XML format

After your AD integration is complete, add the following custom SAML claims in your AD. The SAML claims and attributes are required, for you to be able to successfully sign in to your CDO tenant after your AD integration is done. Note that these values are case sensitive:

- **SamlADUserGroupIds** - This attribute describes all group associations a user has on AD. For example, in Azure select + **Add a group claim** as seen in the screenshot below:

Figure 1: Custom Claims defined in Active Directory

Microsoft Azure

Home > Cisco-CDO-Dev > Enterprise applications > securex-okta-ci > SAML-based Sign-on >

Attributes & Claims

+ Add new claim + Add a group claim Columns | Got feedback?

Required claim

Claim name	Value
Unique User Identifier (Name ID)	user.userprincipalname [nameid-for... ***

Additional claims

Claim name	Value
http://schemas.xmlsoap.org/ws/2005/05/identity/claims/emailaddress	user.mail ***
http://schemas.xmlsoap.org/ws/2005/05/identity/claims/givenname	user.givenname ***
http://schemas.xmlsoap.org/ws/2005/05/identity/claims/name	user.userprincipalname ***
http://schemas.xmlsoap.org/ws/2005/05/identity/claims/surname	user.surname ***
SamlADUserGroupIds	user.groups ***
SamlSourceIdpIssuer	"https://sts.windows.net/1e491488-... ***

- **SamlSourceIdpIssuer** - This attribute uniquely identifies an AD instance. For example, in Azure select **Add a group claim** and scroll to locate the Azure AD Identifier as seen in the screenshot below:

Figure 2: Locate the Azure Active Directory Identifier

The screenshot shows the Azure portal interface for configuring a SAML-based sign-on application. The left sidebar contains navigation options such as Overview, Deployment Plan, Manage (Properties, Owners, Roles and administrators, Users and groups, Single sign-on, Provisioning, Application proxy, Self-service, Custom security attributes), Security (Conditional Access, Permissions, Token encryption), and Activity (Sign-in logs, Usage & insights, Audit logs, Provisioning logs, Access reviews). The main content area is titled 'securex-stage | SAML-based Sign-on' and includes a search bar and navigation links. The 'Attributes & Claims' section is highlighted with a red circle and a '2' in a blue circle, showing a table of attributes and their values. The 'SAML Signing Certificate' section is highlighted with a red circle and a '3' in a blue circle, showing the status and details of the certificate. The 'Set up securex-stage' section is highlighted with a red circle and a '4' in a blue circle, showing the configuration for linking the application with Azure AD, including the Login URL, Azure AD Identifier (highlighted with a red box), and Logout URL.

Add an Active Directory Group for User Management

Procedure

- Step 1** Log in to CDO.
- Step 2** From the admin drop-down in the upper right, click **Settings**.
- Step 3** Click the **User Management** tab.
- Step 4** Select the **Active Directory Groups** tab at the top of the table.
- Step 5** If there are no current AD groups, click **Add AD group**. If there are existing entries, click the Add button.
- Step 6** Enter the following information:

- **Group Name** - Enter a unique name. This name does not have to match the group name in your AD. CDO does not support special characters for this field.
- **Group Identifier** - Manually enter the Group Identifier from your AD. The value of the group identifier should be the same as the group identifier in the custom claim definition. It could be any value that corresponds to the unique identity of the group, for example, my-favourite-group, 12345 and so forth.
- **AD Issuer** - Manually enter the AD Issuer value from your AD.
- **Role** - This determines the role for all the users included in this AD group. See User Roles for more information.
- (Optional) **Notes** - Add any notes that are applicable to this AD group.

Step 7 Select **OK**.

Edit an Active Directory Group for User Management

Before you begin

Note that editing an AD Group's user management in CDO only allows you to modify how CDO limits the AD group. You cannot edit the AD group itself in CDO. You must use AD to edit the list of users within an AD group.

Procedure

Step 1 Log in to CDO.

Step 2 From the admin drop-down in the upper right, click **Settings**.

Step 3 Click the **User Management** tab.

Step 4 Select the **Active Directory Groups** tab at the top of the table.

Step 5 Identify the AD Group you want to edit and select the **Edit** icon.

Step 6 Modify the following values:

- **Group Name** - Enter a unique name. CDO does not support special characters for this field.
 - **Group Identifier** - Manually enter the Group Identifier from your AD. The value of the group identifier should be the same as the group identifier in the custom claim definition. It could be any value that corresponds to the unique identity of the group, for example, my-favourite-group, 12345 and so forth.
 - **AD Issuer** - Manually enter the AD Issuer value from your AD.
 - **Role** - This determines the role for all the users included in this AD group. See User Roles for more information.
 - **Notes** - add any notes that are applicable to this AD group.
-

Delete an Active Directory Group for User Management

Procedure

- Step 1** Log in to CDO.
- Step 2** From the admin drop-down in the upper right, click **Settings**.
- Step 3** Click the **User Management** tab.
- Step 4** Select the **Active Directory Groups** tab at the top of the table.
- Step 5** Identify the AD Group you want to delete.
- Step 6** Select the **Delete** icon.
- Step 7** Click **OK** to confirm you want to delete the AD group.
-

Create a New CDO User

These two tasks are required to create a new CDO user. They do not need to be performed sequentially:

- [Create a Cisco Security Cloud Sign On Account for the New User](#)
- [Create a CDO User Record with Your CDO Username](#)

After these tasks are done, then the user can [The New User Opens CDO from the Cisco Secure Sign-On Dashboard](#).

Create a Cisco Security Cloud Sign On Account for the New User

Creating a Cisco Security Cloud Sign On account can be done at any time by the new user themselves. They do not need to know the name of the tenant they will be assigned to.

About Logging in to CDO

Cisco Defense Orchestrator(CDO) uses Cisco Secure Sign-On as its identity provider and Duo for multi-factor authentication (MFA). **To log into CDO, you must first create your account in Cisco Security Cloud Sign On and configure MFA using Duo.**

CDO requires MFA which provides an added layer of security in protecting your user identity. Two-factor authentication, a type of MFA, requires two components, or factors, to ensure the identity of the user logging into CDO. The first factor is a username and password, and the second is a one-time password (OTP), which is generated on demand.



Important If your CDO tenant existed before October 14, 2019, use [Migrate to Cisco Security Cloud Sign On Identity Provider, on page 4](#) for log in instructions instead of this article.

Before you Log In



Install DUO Security. We recommend installing the Duo Security app on a mobile phone. Review [Duo Guide to Two Factor Authentication: Enrollment Guide](#) if you have questions about installing Duo.

Time Synchronization. You are going to use your mobile device to generate a one-time password. It is important that your device clock is synchronized with real time as the OTP is time-based. Make sure your device clock set automatically or manually set it to the correct time.

Create a New Cisco Security Cloud Sign On Account and Configure Duo Multi-factor Authentication

The initial sign-on workflow is a four-step process. You need to complete all four steps.

Procedure

Step 1 Sign Up for a New Cisco Security Cloud Sign On Account.

- a. Browse to <https://sign-on.security.cisco.com>.
- b. At the bottom of the Sign In screen, click **Sign up now**.

Security Cloud Sign On

Formerly known as SecureX Sign On

Email

Continue

Don't have an account? [Sign up now](#)

Or

[Other login options](#)

- c. Fill in the fields of the Create Account dialog.

Account Sign Up

Provide following information to create enterprise account.

[Back to login page](#)

Email *

sample@cisco.com

First name *

John

Last name *

Smith

Country *

Please select *

Password *

Confirm Password *

I agree to the [End User License Agreement](#) and [Privacy Statement](#).

Sign up

[Cancel](#)

Here are some tips:

- **Email**-Enter the email address that you will eventually use to log in to CDO.
- **Password**-Enter a strong password.

d. After you click **Create Account**.

Cisco sends you a verification email to the address you registered with. Open the email and click **Activate account**.

Step 2 Set up Multi-factor Authentication Using Duo

We recommend using a mobile device when setting up multi-factor authentication.

a. In the **Set up multi-factor authentication** screen, click **Configure factor**.

- b. Click **Start setup** and follow the prompts to choose a mobile device and verify the pairing of that mobile device with your account.

For more information, see [Duo Guide to Two Factor Authentication: Enrollment Guide](#). If you already have the Duo app on your device, you'll receive an activation code for this account. Duo supports multiple accounts on one device.

- c. At the end of the wizard click **Continue to Login**.
- d. Log in to Cisco Security Cloud Sign On with the two-factor authentication.

Step 3 (Optional) Setup Google Authenticator as an additional authenticator

- a. Choose the mobile device you are pairing with Google Authenticator and click **Next**.
- b. Follow the prompts in the setup wizard to setup Google Authenticator.

Step 4 Configure Account Recovery Options for your Cisco Security Cloud Sign On

- a. Choose a recovery phone number for resetting your account using SMS.
- b. Choose a security image.
- c. Click **Create My Account**.

Create a CDO User Record with Your CDO Username

Only a CDO user with "Super Admin" privileges can create the CDO user record. The Super Admin should create the user record with the same email address that was specified in the **Create Your CDO Username** task above.

Use the following procedure to create a user record with an appropriate user role:

Procedure

Step 1 Login to CDO.

Step 2 From the CDO navigation bar, click **Settings > User Management**.

Step 3 Click the blue plus button () to add a new user to your tenant.

Step 4 Provide the email address of the user.

Note The user's email address must correspond to the email address of the Cisco Secure Log-On account.

Step 5 Select the user's [User Roles in CDO](#) from the drop-down menu.

Step 6 Click **OK**.

The New User Opens CDO from the Cisco Secure Sign-On Dashboard

Procedure

- Step 1** Click the appropriate **CDO** tile on the Cisco Secure Sign-on dashboard. The **CDO** tile directs you to <https://defenseorchestrator.com> and the **CDO (EU)** tile directs you to <https://defenseorchestrator.eu>.
- Step 2** Click the authenticator logo to choose Duo Security or Google Authenticator if you have set up both authenticators.
- If you already have a user record on an existing tenant, you are logged into that tenant.
 - If you already have a user record on several portals, you will be able to choose which portal to connect to.
 - If you already have a user record on several tenants, you will be able to choose which CDO tenant to connect to.
 - If you do not already have a user record on an existing tenant, you will be able to learn more about CDO or request a trial tenant.

The **Portals** view retrieves and displays consolidated information from multiple tenants. See [Manage Multi-Tenant Portal](#) for more information.

The **Tenant** view shows several tenants on which you have a user record.



User Roles in CDO

There are a variety of user roles in Cisco Defense Orchestrator (CDO): Read-Only, Edit-Only, Deploy-only, Admin, and Super Admin. User roles are configured for each user on each tenant. If a CDO user has access to more than one tenant, they may have the same user ID but different roles on different tenants. A user may have a read-only role on one tenant and a Super Admin role on another. When the interface or the documentation refers to a Read-only user, an Admin user, or a Super Admin user we are describing that user's permission level on a particular tenant.

Read-only Role

A user assigned the Read-Only role sees this blue banner on every page:

Read Only User. You cannot make configuration changes.

Users with the Read-Only role can do the following:

- View any page or any setting in CDO.
- Search and filter the contents of any page.
- Compare device configurations, view the change log, and see VPN mappings.
- View every warning regarding any setting or object on any page.
- Generate, refresh, and revoke their own API tokens. Note that if a read-only user revokes their own token, they cannot recreate it.
- Contact support through our interface and can export a change log.

Read-Only users **cannot** do the following:

- Create, update, configure, or delete anything on any page.
- Onboard devices.
- Step-through the tasks needed to create something like an object or a policy, but not be able to save it.
- Create CDO user records.
- Change user role.
- Attach or detach access rules to a policy.

Edit-Only Role

Users with the Edit-Only role can do the following:

- Edit and save device configurations, including but not limited to objects, policies, rulesets, interfaces, VPN, etc.
- Allow configuration changes that are made through the **Read Configuration** action.
- Utilize the Change Request Management action.

Edit-Only users **cannot** do the following:

- Deploy changes to a device or to multiple devices.
- Discard staged changes or changes that are detected through OOB.
- Upload AnyConnect Packages, or configure these settings.
- Schedule or manually start image upgrades for devices.
- Schedule or manually start a security database upgrade.
- Manually switch between Snort 2 and Snort 3 versions.
- Create a template.
- Change the existing OOB Change settings.
- Edit System Management settings.
- Onboard devices.
- Delete devices.
- Delete VPN sessions or user sessions.
- Create CDO user records.
- Change user role.

Deploy-Only Role

Users with the Deploy-Only role can do the following:

- Deploy staged changes to a device, or to multiple devices.
- Revert or restore configuration changes for ASA devices.
- Schedule or manually start image upgrades for devices.
- Schedule or manually start a security database upgrade.
- Utilize the Change Request Management action.

Deploy-Only users **cannot** do the following:

- Manually switch between Snort 2 and Snort 3 versions.
- Create a template.
- Change the existing OOB Change settings.
- Edit System Management settings.
- Onboard devices.
- Delete devices.
- Delete VPN sessions or user sessions.
- Create, update, configure, or delete anything on any page.

- Onboard devices.
- Step-through the tasks needed to create something like an object or a policy, but not be able to save it.
- Create CDO user records.
- Change user role.
- Attach or detach access rules to a policy.

VPN Sessions Manager Role

The VPN Sessions Manager role is designed for administrators monitoring remote access VPN connections, not site to site VPN connections.

Users with the VPN Sessions Manager role can do the following:

- View any page or any setting in CDO.
- Search and filter the contents of any page.
- Compare device configurations, view the change log, and see RA VPN mappings.
- View every warning regarding any setting or object on any page.
- Generate, refresh, and revoke their own API tokens. Note that if a VPN Sessions Manager user revokes their own token, they cannot recreate it.
- Contact support through our interface and export a change log.
- Terminate existing RA VPN sessions.

VPN Sessions Manager users **cannot** do the following:

- Create, update, configure, or delete anything on any page.
- Onboard devices.
- Step-through the tasks needed to create something like an object or a policy, but not be able to save it.
- Create CDO user records.
- Change user role.
- Attach or detach access rules to a policy.

Admin Role

Admin users have complete access to most aspects of CDO. Admin users can do the following:

- Create, read, update, and delete any object or policy in CDO and configure any setting.
- Onboard devices.
- View any page or any setting in CDO.
- Search and filter the contents of any page.

- Compare device configurations, view the change log, and see VPN mappings.
- View every warning regarding any setting or object on any page.
- Generate, refresh, and revoke their own API tokens. If their token is revoked, they can contact support through our interface and can export a change log.

Admin users **cannot** do the following:

- Create CDO user records.
- Change user role.

Super Admin Role

Super Admin users have complete access to all aspects of CDO. Super Admins can do the following:

- Change a user role.
- Create user records.



Note Though Super Admins can create a CDO user record, that user record is not all that is needed for a user to log in to your tenant. The user also needs an account with the identity provider used by your tenant. Unless your enterprise has its own single sign-on identity provider, your identity provider is Cisco Security Cloud Sign On. Users can self-register for their Cisco Security Cloud Sign On account; see [Initial Login to Your New CDO Tenant, on page 3](#) for more information.

- Create, read, update, and delete any object or policy in CDO and configure any setting.
- Onboard devices.
- View any page or any setting in CDO.
- Search and filter the contents of any page.
- Compare device configurations, view the change log, and see VPN mappings.
- View every warning regarding any setting or object on any page.
- Generate, refresh, and revoke their own API tokens. If their token is revoked, they can
- Contact support through our interface and can export a change log.

Change The Record of the User Role

The user record is the currently recorded role of a user. By looking at the users associated with your tenant, you can determine what role each user has by their record. By changing a user role, you change the user record. User's roles are identified by their role in the User Management table. See [Manage Users in CDO](#) for more information.

You must be a Super Admin to change the user record. If your tenant has no Super Admins, contact [How CDO Customers Open a Support Ticket with TAC](#).

Add a User Account to CDO

CDO users need a CDO record and a corresponding IdP account so they can be authenticated and access your CDO tenant. This procedure creates the user's CDO user record, not the user's account in Cisco Security Cloud Sign On. If the user does not have an account in Cisco Security Cloud Sign On, they can self-enroll by navigating to <https://sign-on.security.cisco.com> and clicking **Sign up** at the bottom of the Sign in screen.



Note You will need to have the role of [Super Admin Role](#) on CDO to perform this task.

Create a User Record

Use the following procedure to create a user record with an appropriate user role:

Procedure

Step 1 Log in to CDO.

Step 2 From the CDO navigation bar, click **Settings > User Management**.

Step 3 Click the blue plus button () to add a new user to your tenant.

Step 4 Provide the email address of the user.

Note The user's email address must correspond to the email address of the Cisco Secure Log-On account.

Step 5 Select the user's [User Roles in CDO](#) from the drop-down menu.

Step 6 Click v.

Note Though Super Admins can create a CDO user record, that user record is not all that is needed for a user to log in to your tenant. The user also needs an account with the identity provider used by your tenant. Unless your enterprise has its own single sign-on identity provider, your identity provider is Cisco Secure Sign-on. Users can self-register for their Cisco Secure Sign-On account; see [Initial Login to Your New CDO Tenant, on page 3](#) for more information.

Create API Only Users

Procedure

Step 1 Log in to CDO.

Step 2 From the CDO navigation bar, click **Settings > User Management**.

Step 3 Click the blue plus button () to add a new user to your tenant.

- Step 4** Select the **API Only User** checkbox.
- Step 5** In the **Username** field, enter a name for the user and click **OK**.
- Important** the user name can't be an email address or contain the '@' character as the '@yourtenant' suffix will be automatically appended to the user name.
- Step 6** Select the user's [User Roles in CDO](#) from the drop-down menu.
- Step 7** Click **OK**.
- Step 8** Click the **User Management** tab.
- Step 9** In the **Token** column for the new API Only user, click **Generate API Token** to obtain an API token.

Edit a User Record for a User Role

You will need to have the role of Super Admin to perform this task. If the Super Admin changes the role of a CDO user that is logged in, once their role has been changed, the user is automatically logged out of their session. Once the user logs back in, they assume their new role.



Note You will need to have the role of [Super Admin Role](#) on CDO to perform this task.



Caution Changing the role of a user record will delete an [API Tokens](#) associated with the user record if there is one. The user must generate a new API token once the user role changes.

Edit a User Role



Note If a CDO user is logged in, and a Super Admin changes their role, the user must log out and log back in again for the change to take affect.

To edit the role defined in the user record, follow this procedure:

Procedure

- Step 1** Log in to CDO.
- Step 2** From the CDO navigation bar, click **Settings > User Management**.
- Step 3** Click the edit icon in the user's row.
- Step 4** Select the user's new [User Roles in CDO](#) from the Role drop-down menu.
- Step 5** If the user record shows that there is an API token associated with the user, you will need to confirm that you want to change the user's role and delete the API token as a result.
- Step 6** Click **v**.

- Step 7** If CDO deleted the API token, contact the user so that they may create a new API Token.
-

Delete a User Record for a User Role

Deleting a user record in CDO prevents the associated user from logging in to CDO by breaking the mapping of the user record with the Cisco Security Cloud Sign On account. When you delete a user record, you are also deleting the API token associated with that user record should there be one. Deleting a user record in CDO does not delete the user's IdP account in Cisco Security Cloud Sign On.



Note You will need to have the role of [Super Admin Role](#) on CDO to perform this task.

Delete a User Record

To delete the role defined in the user record, see the following procedure:

Procedure

- Step 1** Log in to CDO.
 - Step 2** From the CDO navigation bar, click **Settings > User Management**.
 - Step 3** Click the trash can icon  in the row of the user you want to delete.
 - Step 4** Click **OK**.
 - Step 5** Confirm that you want to remove the account from the tenant by clicking OK.
-

CDO Services Page

The **Services** page displays a list of services that CDO provides. Selecting the **FMC** tab lists the cloud-delivered Firewall Management Center that is linked to the CDO account and all the on-prem management centers onboarded to CDO. The devices that are managed by these on-prem management centers are listed in the **Inventory** page. The **Services** page also lists the secure connectors under the **Secure Connectors** tab.

You can click the **FMC** tab and onboard an on-prem management center by clicking the blue plus icon () and perform device actions using the options in the right pane. You can also see device information such as version, number of devices being managed by the management center, device type, and the synchronization status of the device. Clicking on the managed devices icon takes you to the **Inventory** page, where devices managed by the selected on-prem management center are filtered automatically and displayed. The **Services** page also allows you to select more than one on-prem management center at a time for you to perform actions on a group of management centers all at once. You cannot select any on-prem management center while the cloud-delivered Firewall Management Center is selected. To add a new secure connector or perform actions on existing secure connectors, choose the **Secure Connectors** tab and click .

Navigate **Tools & Services > Firewall Management Center**.

The screenshot shows the 'Services' page in Cisco Defense Orchestrator. The main content area displays a table of Firewall Management Center (FMC) instances. The table has columns for Name, Version, Devices, Type, Status, and Last Heartbeat. The first row is selected, showing 'Cloud-Delivered FMC' with version 20230711, 3 devices, and an 'Active' status. Below the table, there are tabs for 'Tools & Services' and 'Migrations'. The 'Tools & Services' tab is active, showing 'Secure Connectors' and 'Firewall Management Center' (checked). The right-hand side of the page features three panels: 'Firewall Management Center' (with a search bar), 'Actions' (containing 'Check For Changes', 'Deployment', 'Updates', 'Workflows', and 'API Explorer'), 'Management' (containing 'Devices', 'Policies', 'Objects', 'NAT', 'Site to Site VPN', 'Remote Access VPN', and 'Platform Settings'), and 'System' (containing 'Configuration', 'Smart Licenses', 'AMP Management', 'Device Health', 'Audit', and 'Cisco Cloud Events').

Name	Version	Devices	Type	Status	Last Heartbeat
Cloud-Delivered FMC	20230711	3	Cloud-Delivered FMC	Active	17:29:29 08/28/2023
	7.4.0-build 1908	3	On-Prem FMC	Synced	13:34:43 08/28/2023
	7.3.0-build 69	6	On-Prem FMC	Synced	13:34:43 08/28/2023
	7.3.1-build 19	4	On-Prem FMC	Synced	13:34:43 08/28/2023

For your cloud-delivered Firewall Management Center, the Services page displays the following information:

- If you do not have a cloud-delivered Firewall Management Center deployed on your tenant, click **Enable Cloud-Delivered FMC**. See [Enable Cloud-Delivered Firewall Management Center on Your CDO Tenant](#) for more information.
- The number of Secure Firewall Threat Defense devices deployed on the cloud-delivered Firewall Management Center.
- Status of the connection between CDO and the cloud-delivered Firewall Management Center page.
- The last heartbeat of the cloud-delivered Firewall Management Center. This represents the last time the status of the cloud-delivered Firewall Management Center itself and the number of devices that it manages were synchronized with the table on this page.
- The hostname of the selected cloud-delivered Firewall Management Center.

Choose **Cloud-Delivered FMC** and using the links in the **Actions**, **Management**, or **Settings** pane, you open the cloud-delivered Firewall Management Center user interface to perform the configuration tasks that are associated with the link you clicked.

Actions:

- **Check For Changes:** The Device Count and Status information in the table will be updated with the information available the last time this page and the cloud-delivered Firewall Management Center were synchronized. Synchronization happens every 10 minutes.
- **Deployment:** Takes you to the device configuration deployment page on cloud-delivered Firewall Management Center. See [Deploy Configuration Changes](#).
- **Workflows:** Takes you to the **Workflows** page to monitor every process that CDO runs when communicating with devices. See [Workflows](#) page.
- **API Explorer:** Takes you to the page that lists the cloud-delivered Firewall Management Center REST APIs. See [Secure Firewall Management Center REST API Guide](#).

Management:

- **Devices:** Takes you to the threat defense device listing page on the cloud-delivered Firewall Management Center portal. See [Configure Devices](#).
- **Policies:** Takes you to the policies page on the cloud-delivered Firewall Management Center portal to edit system-provided access control policies and create custom access control policies. See [Manage Access Control Policies](#).
- **Objects:** Takes you to the policies page on the cloud-delivered Firewall Management Center portal to manage reusable objects. See [Object Management](#).
- **NAT:** Takes you to the policies page on the cloud-delivered Firewall Management Center portal to configure Network Address Translation policies on the threat defense devices. See [Manage NAT policies](#).
- **Site to Site VPN:** Takes you to the site-to-site VPN dashboard page on the cloud-delivered Firewall Management Center portal to configure site-to-site VPN policy between two sites. See [Site-to-Site VPNs](#).
- **Remote Access VPN:** Takes you to the remote access VPN dashboard page on the cloud-delivered Firewall Management Center portal to configure a remote access VPN configuration. See [Remote Access VPN](#).
- **Platform Settings:** Takes you to the platform settings page on the cloud-delivered Firewall Management Center portal configure a range of unrelated features whose values you might want to share among several devices. See [Platform Settings](#).

System:

- **Configuration:** Takes you to the system configuration settings page on the cloud-delivered Firewall Management Center portal to configure system configuration settings. See [System Configuration](#).
- **Smart Licenses:** Takes you to the smart licenses page on the cloud-delivered Firewall Management Center portal to assign licenses to devices. See [Assign Licenses to Devices](#).
- **AMP Management:** Takes you to the AMP management page on the cloud-delivered Firewall Management Center portal that provides intelligence that the system uses to detect and block malware on your network. See [Cloud Connections for Malware Protection](#).
- **Device Health:** Takes you to the health monitoring page on the cloud-delivered Firewall Management Center portal that tracks various health indicators to ensure that the hardware and software in the system are working correctly. See [About Health Monitoring](#).
- **Audit:** Takes you to the audit log page on the cloud-delivered Firewall Management Center portal to show the generated audit record for each user interaction with the web interface.
- **Cisco Cloud Events:** Takes you to the configure Cisco Cloud events page on the CDO portal to configure cloud-delivered Firewall Management Center to send events directly to SAL (SaaS). See [Send Events to SAL \(SaaS\)](#).

After opening the cloud-delivered Firewall Management Center page, click the blue question mark button and select **Page-level Help** to learn more about the page you are on and what further action you can take.

Support to Open CDO and Cloud-delivered Firewall Management Center Applications on Different Tabs

As you configure threat defense devices or objects in the cloud-delivered Firewall Management Center, you can open the appropriate configuration pages in additional browser tabs to work simultaneously in the CDO and the cloud-delivered Firewall Management Center portals without logging off. For example, you can create

an object on the cloud-delivered Firewall Management Center and simultaneously monitor event logs on CDO that are generated from the security policies.

This feature is available for all CDO links that navigate to the cloud-delivered Firewall Management Center portal. To open the cloud-delivered Firewall Management Center portal in a new tab:

On the CDO portal, press and hold the **Ctrl** (Windows) or **Command** (Mac) button, then click the corresponding link.



Note A single click opens the cloud-delivered Firewall Management Center page in the same tab.

Here are some examples of opening the cloud-delivered Firewall Management Center portal page in a new tab:

- Choose **Tools & Services > Firewall Management Center** and select **Cloud-Delivered FMC**.
In the right pane, press and hold the **Ctrl** (Windows) or **Command** (Mac) button, and then click the page that you want to access.
- Choose **Objects > Other FTD Objects**.
- Click the search icon in the top-right corner of the CDO page and enter the search strings in the search field that appears.
From the search result, press and hold the **Ctrl** (Windows) or **Command** (Mac) button, and then click the arrow icon.
- Choose **Dashboard > Quick Actions**.
Press and hold the **Ctrl** (Windows) or **Command** (Mac) button, and then click **Manage FTD Policies** or **Manage FTD Objects**.



Note When you switch to a new CDO tenant, the corresponding cloud-delivered Firewall Management Center portal already opened in a new tab logs out.

Related Topics

- [Managing On-Prem Firewall Management Center with Cisco Defense Orchestrator](#)
- [Onboard an On-Prem Firewall Management Center](#)
- [Request a cloud-delivered Firewall Management Center for your CDO tenant](#)
- [Secure Device Connector](#)
- [Secure Event Connectors](#)

CDO Device and Service Management

Cisco Defense Orchestrator (CDO) provides the ability to view, manage, filter, and evaluate your onboarded devices on the **Inventory** page. From the **Inventory** page you can:

- Onboard devices and services for CDO management.
- View the configuration state and connectivity state of managed devices and services.
- View onboarded devices and templates categorized in separate tabs. See [CDO Inventory Information, on page 83](#).
- Evaluate and take action on individual devices and services.
- View device and service specific information and resolve issues.
- View device health status for threat defense devices managed by:
 - [cloud-delivered Firewall Management Center](#)
 - [on-prem management center](#)

For threat defense devices managed by the cloud-delivered Firewall Management Center, you can also see the node status for devices in a cluster.

- Search for a device or template by name, type, IP address, model name, serial number, or labels. Search is not case-sensitive. Providing multiple search terms brings up devices and services that match at least one of the terms. See [Page Level Search, on page 85](#).
- Filter for a device or template filter by device type, hardware and software versions, snort version, configuration status, connection states, conflict detection, and secure device connectors, and labels. See [Filters](#).

Changing a Device's IP Address in CDO

When you onboard a device to Cisco Defense Orchestrator (CDO) using an IP address, CDO stores that IP address in its database and communicates with the device using that IP address. If the IP address of the device changes, you can update the IP address stored in CDO to match the new address. Changing the device's IP address on CDO does not change device's configuration.

To change the IP address, CDO uses to communicate with a device, follow this procedure:

Procedure

-
- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab to locate the device.
 - Step 3** Click the appropriate device type tab.
You can use the [Filters](#) and [Page Level Search](#) functionalities to find the required device.
 - Step 4** Select the device whose IP address it is you want to change.
 - Step 5** Above the **Device Details** pane, click the edit button next to the device's IP address.

Nashua Building 1 
ASA 10.86.118.4:443 

- Step 6** Enter the new IP address in the field and click the blue check button.

No change is made to the device itself, so the device's Configuration Status will continue to show that it is Synced.

Related Information:

- [Moving Devices Between Tenants, on page 82](#)
- [Bulk Reconnect Devices to CDO, on page 81](#)

Changing a Device's Name in CDO

All devices, models, templates, and services are given a name when they are onboarded or created in CDO. You can change that name without changing the configuration of the device itself.

Procedure

- Step 1** From the navigation bar, click **Inventory**.
- Step 2** Click the **Device** tab to locate the device.
- Step 3** Select the device whose name it is you want to change.
- Step 4** Above the **Device Details** pane, click the edit button next to the device's name.

Nashua Building 1 

- Step 5** Enter the new name in the field and click the blue check button.
- No change is made to the device itself, so the device's Configuration Status will continue to show that it is Synced.
-

Export a List of Devices and Services

This article explains how to export your list of devices and services to a comma-separated value (.csv) file. Once in that format, you can open the file in a spreadsheet application such as Microsoft Excel to sort and filter the items in your list.

The export button is available in the devices and the templates tab. You are also allowed to export details from devices under the selected device type tab.

Before you export your list of devices and services, look at the filter pane and determine if the Inventory table is displaying the information you want to export. Clear all your filters to see all of your managed devices and services, or filter the information to display a subset of all your devices and services. The export function exports what you can see in the Inventory table.

Procedure

- Step 1** In the CDO navigation bar, click **Inventory**.

- Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
- Step 3** Click the appropriate device type tab to export details from devices under that tab or click **All** to export details from all devices.

You can use the [Filters](#) and [Page Level Search](#) functionalities to find the required device.

- Step 4** Click **Export list to CSV**:



- Step 5** If prompted, save the .csv file.
- Step 6** Open the .csv file in a spreadsheet application to sort and filter the results.

Export Device Configuration

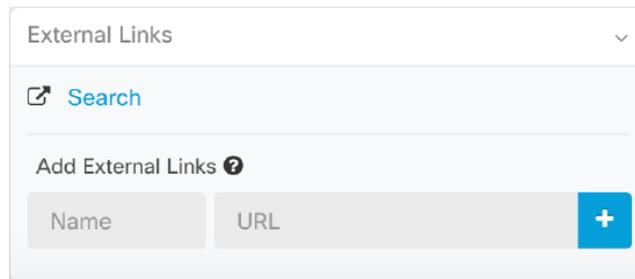
You can only export one device configuration at a time. Use the following procedure to export a device's configuration to a JSON file:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
- Step 3** Click the appropriate device type tab.
- You can use the [Filters](#) and [Page Level Search](#) functionalities to find the required device.
- Step 4** Select the device you want so it is highlighted.
- Step 5** In the **Actions** pane, select **Export Configuration**.
- Step 6** Select **Confirm** to save the configuration as a JSON file.

External Links for Devices

You can create a hyperlink to an external resource and associate it with a device you manage with CDO. You could use this feature to create a convenient link to the local manager of one of your devices (). You could also use it to link to a search engine, documentation resource, a corporate wiki, or any other URL that you choose. You can associate as many external links with a device as you want. You can also associate the same link with multiple devices at the same time.



The links you create can reach anywhere, but your company's security requirements do not change. For example, if you ordinarily need to be connected to your corporate network, by being on-premises or through a VPN connection to reach a particular URL, those requirements remain. If your company blocks specific URLs, those URLs continue to be blocked. URLs that are not restricted continue to not be restricted.

Location Variable

We have created the {location} variable that you can incorporate in your URLs. This variable will be populated with the IP address of your device. For example,

```
https://{location}
```

.

Related Information:

- [Write a Device Note, on page 82](#)
- [Export a List of Devices and Services, on page 77](#)

Create an External Link from your Device

Procedure

-
- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select a device or model.
You can use the [Filters](#) and [Page Level Search](#) functionalities to find the required device.
 - Step 5** In the details pane, on the right, go to the **External Links** section.
 - Step 6** Enter a name for the link.
 - Step 7** Enter the URL for the link in the URL field. You need to specify the full URL, for example, for Cisco enter <http://www.cisco.com>.
 - Step 8** Click + to associate the link with the device.
-

Create an External Link to

Here is a convenient way to open , directly from CDO.

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
- Step 3** Click the appropriate device type tab.
- You can use the [Filters](#) and [Page Level Search](#) functionalities to find the required device.
- Step 4** Select a device or model.
- Step 5** In the details pane, on the right, go to the **External Links** section.
- Step 6** Enter a name for the link such as .
- Step 7** Enter `https://{location}` in the URL field. The `{location}` variable will be populated with the IP address of your device.
- Step 8** Click the + box.
-

Create an External Link for Multiple Devices

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
- Step 3** Click the appropriate device type tab.
- You can use the [Filters](#) and [Page Level Search](#) functionalities to find the required devices.
- Step 4** Select multiple devices or models.
- Step 5** In the details pane, on the right, go to the **External Links** section.
- Step 6** Enter a name for the link.
- Step 7** Enter the URL you want to reach using one of these methods:
- Enter `https://{location}` in the URL field. The `{location}` variable will be populated with the IP address of your device. This creates an automatic link to the ASDM for your device.
 - Enter the URL for the link in the URL field. You need to specify the full URL, for example, for Cisco enter <http://www.cisco.com>.
- Step 8** Click + to associate the link with the device.
-

Edit or Delete External Links

Procedure

- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
 - Step 3** Click the appropriate device type tab.
You can use the [Filters](#) and [Page Level Search](#) functionalities to find the required device.
 - Step 4** Select a device or model.
 - Step 5** In the details pane, on the right, go to the **External Links** section.
 - Step 6** Mouse-over the name of the link to reveal the edit and delete icons.
 - Step 7** Click the appropriate icon to edit or delete the external link and confirm your action.
-

Edit or Delete External Links for Multiple Devices

Procedure

- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
 - Step 3** Click the appropriate device type tab.
You can use the [Filters](#) and [Page Level Search](#) functionalities to find the required devices.
 - Step 4** Select multiple devices or models.
 - Step 5** In the details pane, on the right, go to the **External Links** section.
 - Step 6** Mouse-over the name of the link to reveal the edit and delete icons.
 - Step 7** Click the appropriate icon to edit or delete the external link and confirm your action.
-

Bulk Reconnect Devices to CDO

CDO allows an administrator to attempt to reconnect more than one managed device to CDO at the same time. When a device CDO manages is marked "unreachable," CDO can no longer detect out of band configuration changes or manage the device. There could be many different reasons for the disconnect. Attempting to reconnect the devices is a simple first step in restoring CDO's management of the device.



-
- Note** If you are reconnecting devices having new certificates, CDO automatically reviews and accepts the new certificates on the devices and continues to reconnect with them. However, if you are reconnecting with only one device, CDO prompts you to review and accept the certificate manually to continue to reconnect with it.
-

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab to locate devices.
- Step 3** Click the appropriate device type tab.
- Use the [Filters](#) to look for devices whose connectivity status is "unreachable."
- Step 4** From the filtered results, select the devices you want to attempt to reconnect.
- Step 5** Click **Reconnect** . Notice that CDO only provides command buttons for actions that can be applied to all the selected devices.
- Step 6** Look at the **notifications** tab for the progress of the bulk device reconnect action. If you want more information about how the actions in the bulk device reconnect job succeeded or failed, click the blue Review link and you will be directed to the [Monitor Jobs in CDO, on page 138](#).
- Tip** If a reconnect failure was caused because the device's certificate or credentials have changed, you will have to reconnect to those devices individually to add the new credentials and accept the new certificate.
-

Moving Devices Between Tenants

Once you have onboarded devices to a CDO tenant, you cannot migrate the devices from one CDO tenant to another. If you want to move your devices to a new tenant, you need to remove the devices from the old tenant and re-onboard them to the new tenant.

Write a Device Note

Use this procedure to create a single, plain-text, note file for a device.

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
- Step 3** Click the appropriate device type tab.
- Step 4** Select the device or model you want to create a note for.
- Step 5** In the **Management** pane on the right, click **Notes**.  [Notes](#).
- Step 6** Click the editor button on the right and select the Default text editor, Vim, or Emacs text editors.
- Step 7** Edit the Notes page.
- Step 8** Click **Save**.
- The note is saved in the tab.
-

CDO Inventory Information

The **Inventory** page shows all physical and virtual onboarded devices and templates created from the onboarded devices. The page classifies devices and templates based on their type and displays them in the corresponding tabs dedicated to each device type. You can use [Page Level Search](#) functionality or apply a [Filters](#) to find devices within the selected device type tab.

You can view the following details on this page:

- The **Devices** tab shows all the live devices that are onboarded to CDO.
- The **Templates** shows all the template devices created from live devices or configuration files imported to CDO.

CDO Labels and Filtering

Labels are used for grouping devices or objects. You can apply labels to one or more devices during onboarding or at any time after onboarding. You can apply labels to objects after you create them. Once you have applied labels to devices or objects, you can filter the contents of the device table or objects table by that label.



Note A label applied to a device is not extended to its associated objects, and a label applied to a shared object is not extended to its associated objects.

You can create a label group by using the following syntax “group name:label”. For example, Region:East or Region:West. If you were to create these two labels, the group label would be Region and you could choose from East or West in that group.

Applying Labels to Devices and Objects

To apply a label to devices, perform the following steps:

Procedure

- Step 1** To add a label to a device, click **Inventory** in the navigation pane on the left. To add a label to an object, click **Objects** in the navigation pane on the left.
 - Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select one or more devices or model in the generated table.
 - Step 5** In the **Add Groups and Labels** field on the right, specify a label for the device.
 - Step 6** Click blue + icon.
-

Filters

You can use many different filters on the **Inventory** and **Objects** pages to find the devices and objects you are looking for.

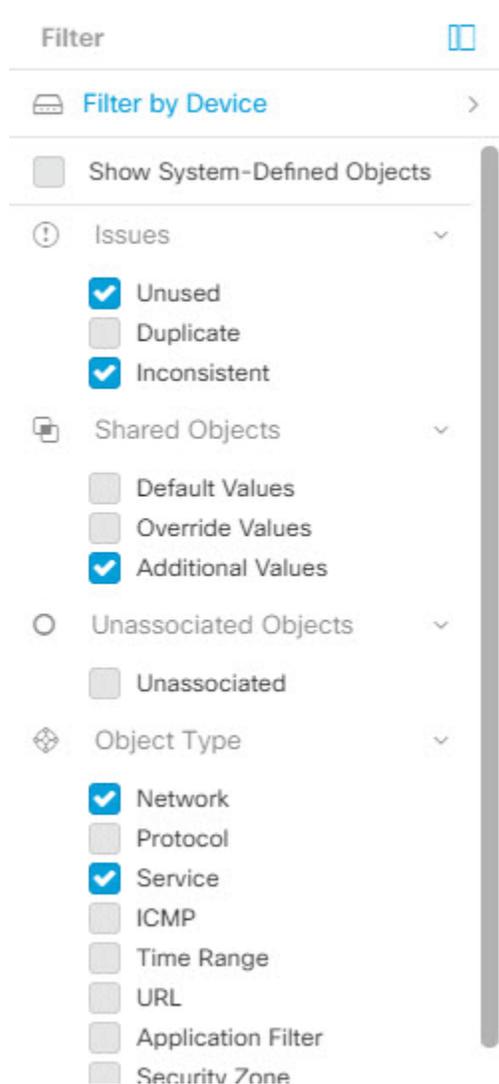
To filter, click  in the left-hand pane of the Inventory, Policies, and Objects tabs:

The Inventory filter allows you to filter by device type, hardware and software versions, snort version, configuration status, connection states, conflict detection, and secure device connectors, and labels. You can apply filters to find devices within a selected device type tab. You can use filters to find devices within the selected device type tab.

The object filter allows you to filter by device, issue type, shared objects, unassociated objects, and object type. You can include system objects in your results or not. You can also use the search field to search for objects in the filter results that contain a certain name, IP address, or port number.

When filtering devices and objects, you can combine your search terms to create several potential search strategies to find relevant results.

In the following example, filters are applied to search objects that are "Issues (Used OR Inconsistent) AND Shared Objects with Additional Values AND Objects of type Network OR Service.



Use CDO Search Functionality

The CDO platform has a highly efficient search function that makes it easy to find anything you need. The search bar on each page is tailored to the content of that page, while the global search allows for a comprehensive search across the entire tenant. This saves time and effort, as you can quickly locate the necessary information.

Page Level Search

The page-level search enables you to search specific items on the Inventory, Policies, Objects, VPN, Change Log, and Jobs pages.

- In the **Inventory** space, you can simply start typing in the search bar, and devices that fit the search criteria will be displayed. You can type any partial part name of the device, IP address, or the serial number of the physical device to find the device.

- In the **Policies** space, you can search policies by their name, components or objects used in them.
- In the **Objects** space, you can search for an object by typing any partial part of the name of the object, or partial IP Address, port, or protocols.
- In the **VPN** space, you can search by tunnel name, device name, and IP address used in the VPN policies.
- In the **Change log** space, you can search logs based on events, device names, or actions.

Procedure

-
- Step 1** Navigate to the search bar near the top of the interface.
- Step 2** Type the search criteria into the Search Bar and the corresponding results will be displayed.
-

Objects

An object is a container of information that you can use in one or more security policies. Objects make it easy to maintain policy consistency. You can create a single object, use it different policies, modify the object, and that change is propagated to every policy that uses the object. Without objects, you would need to modify all the policies, individually, that require the same change.

When you onboard a device, CDO recognizes all the objects used by that device, saves them, and lists them on the **Objects** page. From the **Objects** page, you can edit existing objects and create new ones to use in your security policies.

CDO calls an object used on multiple devices a **shared object** and identifies them in the **Objects** page with this badge .

Sometimes a shared object develops some "issue" and is no longer perfectly shared across multiple policies or devices:

- **Duplicate objects** are two or more objects on the same device with different names but the same values. These objects usually serve similar purposes and are used by different policies. Duplicate objects are identified by this issue icon: .
- **Inconsistent objects** are objects on two or more devices with the same name but different values. Sometimes users create objects in different configurations with same name and content but over time the values of these objects diverge which creates the inconsistency. Inconsistent objects are identified by this issue icon: .
- **Unused objects** are objects that exist in a device configuration but are not referenced by another object, an access-list, or a NAT rule. Unused objects are identified by this issue icon: .

You can also create objects for immediate use in rules or policies. You can create an object that is unassociated with any rule or policy.

You can view the objects managed by CDO by navigating to the **Objects** menu or by viewing them in the details of a network policy.

CDO allows you to manage network and service objects across supported devices from one location. With CDO, you can manage objects in these ways:

- Search for and [Object Filters](#) based on a variety of criteria.
- Find duplicate, unused, and inconsistent objects on your devices and consolidate, delete, or resolve those object issues.
- Find unassociated objects and delete them if they are unused.
- Discover shared objects that are common across devices.
- Evaluate the impact of changes to an object on a set of policies and devices before committing the change.
- Compare a set of objects and their relationships with different policies and devices.
- Capture objects in use by a device after it has been on-boarded to CDO.

If you have issues with creating, editing, or reading objects from an onboarded device, see [Troubleshoot Cisco Defense Orchestrator, on page 153](#) for more information.

Object Types

The following table describes the objects that you can create for your devices and manage using CDO.

Shared Objects

Cisco Defense Orchestrator (CDO) calls objects on multiple devices with the same name and same contents, **shared objects**. Shared objects are identified by this icon



on the **Objects** page. Shared objects make it easy to maintain policies because you can modify an object in one place and that change affects all the other policies that use that object. Without shared objects, you would need to modify all the policies individually that require the same change.

When looking at a shared object, CDO shows you the contents of the object in the object table. Shared objects have exactly the same contents. CDO shows you a combined or "flattened" view of the elements of the object in the details pane. Notice that in the details pane, the network elements are flattened into a simple list and not directly associated with a named object.

The screenshot displays the Cisco Defense Orchestrator interface. On the left, the 'Objects' panel shows a list of objects. The 'ATL-TMG-INT' object is highlighted, and its details are shown in the right-hand panel. The 'ATL-TMG-INT' object is a 'Network Group' containing a 'Network' object. The 'Network' object is highlighted, and its details are shown in the right-hand panel. The 'Network' object is a 'Network Object' with the following IP addresses: 130.131.230.149 and 130.131.230.150. The 'Relationships' section shows three relationships: 'locksco1', 'locksco3', and 'locksco_1_1'.

OBJECT REFERENCE	TYPE
ATLFTMGP01	Network Object
ATLFTMGP02	Network Object

Relationships
locksco1
locksco3
locksco_1_1

Object Overrides

An object override allows you to override the value of a shared network object on specific devices. CDO uses the corresponding value for the devices that you specify when configuring the override. Although the objects are on two or more devices with the same name but different values, CDO doesn't identify them as **Inconsistent objects** only because these values are added as overrides.

You can create an object whose definition works for most devices, and then use overrides to specify modifications to the object for the few devices that need different definitions. You can also create an object that needs to be overridden for all devices, but its use allows you to create a single policy for all devices. Object overrides allow you to create a smaller set of shared policies for use across devices without giving up the ability to alter policies when needed for individual devices.

For example, consider a scenario where you have a printer server in each of your offices, and you have created a printer server object `print-server`. You have a rule in your ACL to deny printer servers from accessing the internet. The printer server object has a default value that you want to change from one office to another. You can do this by using object overrides and maintain rule and "printer-server" object consistent across all locations, although their values may be different.

Editing Shared Network Object
✕

Object Name *

Devices

2 Devices

Usage

0 Rule Sets

Description

Default Value ▾

ASAv-99-18

Override Values ▾

Value	Devices	
126.0.2.4	Pasadena-ftd-730-516-...	✎ ⬆ 🗑
126.0.1.6	BGL_FTD_7.3	✎ ⬆ 🗑
126.0.1.9	connected_fmc	✎ ⬆ 🗑

Cancel Save



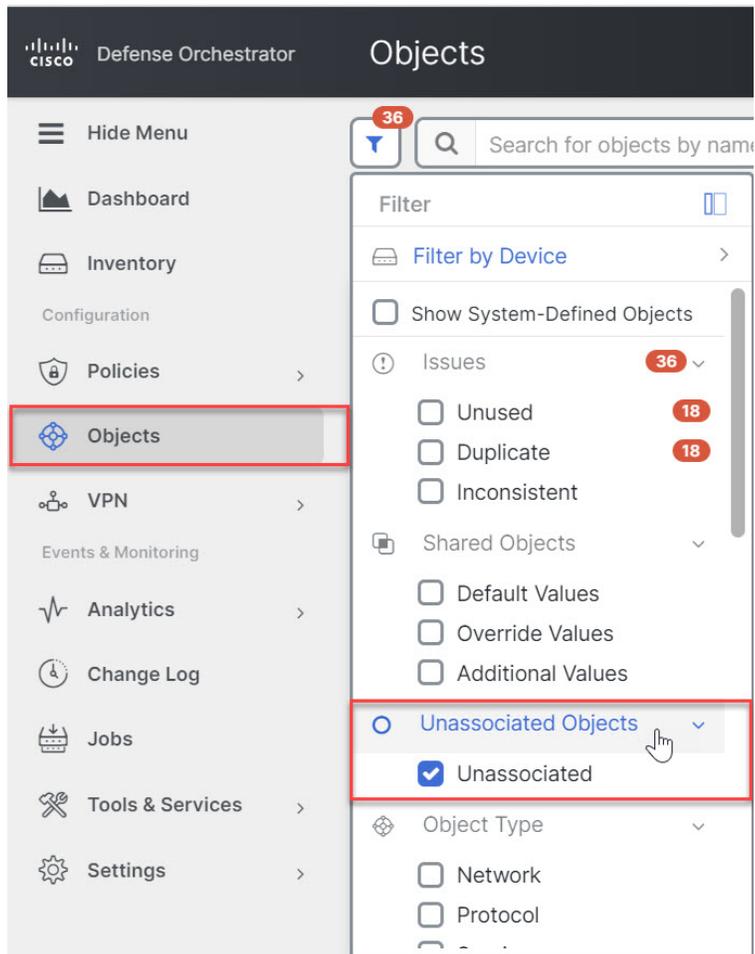
Note If there are inconsistent objects, you can combine them into a single shared object with overrides. See [Resolve Inconsistent Object Issues, on page 158](#) for more information.

Unassociated Objects

You can create objects for immediate use in rules or policies. You can also create an object that is unassociated with any rule or policy. When you use that unassociated object in a rule or policy, CDO creates a copy of it and uses the copy. The original unassociated object remains among the list of available objects until it is either deleted by a nightly maintenance job, or you delete it.

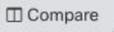
Unassociated objects remain in CDO as a copy to ensure that not all configurations are lost if the rule or policy associated with the object is deleted accidentally.

To view unassociated objects click in the left-hand pane of the Objects tab and check the **Unassociated** checkbox.



Compare Objects

Procedure

- Step 1** In the CDO navigation bar on the left, click **Objects** and choose an option.
- Step 2** Filter the objects on the page to find the objects you want to compare.
- Step 3** Click the **Compare** button .
- Step 4** Select up to three objects to compare.
- Step 5** View the objects, side-by-side, at the bottom of the screen.
 - Click the up and down arrows in the Object Details title bar to see more or less of the Object Details.
 - Expand or collapse the Details and Relationships boxes to see more or less information.
- Step 6** (Optional) The Relationships box shows how an object is used. It may be associated with a device or a policy. If the object is associated with a device, you can click the device name and then click **View Configuration**

to see the configuration of the device. CDO shows you the device's configuration file and highlights the entry for that object.

Filters

You can use many different filters on the **Inventory** and **Objects** pages to find the devices and objects you are looking for.

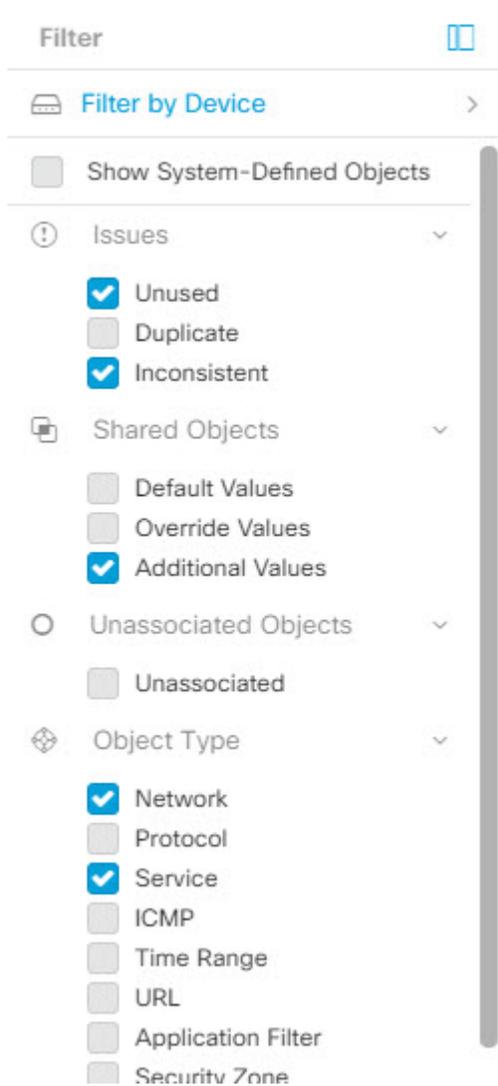
To filter, click  in the left-hand pane of the Inventory, Policies, and Objects tabs:

The Inventory filter allows you to filter by device type, hardware and software versions, snort version, configuration status, connection states, conflict detection, and secure device connectors, and labels. You can apply filters to find devices within a selected device type tab. You can use filters to find devices within the selected device type tab.

The object filter allows you to filter by device, issue type, shared objects, unassociated objects, and object type. You can include system objects in your results or not. You can also use the search field to search for objects in the filter results that contain a certain name, IP address, or port number.

When filtering devices and objects, you can combine your search terms to create several potential search strategies to find relevant results.

In the following example, filters are applied to search objects that are "Issues (Used OR Inconsistent) AND Shared Objects with Additional Values AND Objects of type Network OR Service.



Object Filters

To filter, click  in the left-hand pane of the Objects tab:

- **All Objects** – This filter provides you all the objects available from all the devices you have on-boarded in CDO. This filter is useful to browse all your objects, or as a starting point to search or further apply sub-filters.
- **Shared Objects** – This quick filter shows you all the Objects that CDO has found to be shared on more than one device.
- **Objects By Device** – Lets you pick a specific device so that you can see objects found on the selected device.

Sub filters – Within each main filter, there are sub-filters you can apply to further narrow down your selection. These sub-filters are based on Object Type – Network, Service, Protocol, etc.

The selected filters in this filter bar would return objects that match the following criteria:

- * Objects that are on one of two devices. (Click **Filter by Device** to specify the devices.) AND are
- * **Inconsistent** objects AND are
- * **Network** objects OR **Service** objects AND
- * Have the word "**group**" in their object naming convention

Because **Show System Objects** is checked, the result would include both system objects and user-defined objects.

Show System Objects Filter

Some devices come with pre-defined objects for common services. These system objects are convenient because they are already made for you and you can use them in your rules and policies. There can be many system objects in the objects table. System objects cannot be edited or deleted.

Show System Objects is **off** by default. To display system objects in the object table, check **Show System Objects** in the filter bar. To hide system objects in the object table, leave Show System Objects unchecked in the filter bar.

If you hide system objects, they will not be included in your search and filtering results. If you show system objects, they will be included in your object search and filtering results.

Configure Object Filters

You can filter on as few or as many criteria as you want. The more categories you filter by, the fewer results you should expect.

Procedure

-
- Step 1** In the CDO navigation bar on the left, click **Objects** and choose an option.
 - Step 2** Open the filter panel by clicking the filter icon  at the top of the page. Uncheck any filters that have been checked to make sure no objects are inadvertently filtered out. Additionally, look at the search field and delete any text that may have been entered in the search field.
 - Step 3** If you want to restrict your results to those found on particular devices:
 - a. Click **Filter By Device**.
 - b. Search all the devices or click a device tab to search for only devices of a certain kind.
 - c. Check the device you want to include in your filter criteria.
 - d. Click **OK**.
 - Step 4** Check **Show System Objects** to include system objects in your search results. Uncheck **Show System Objects** to exclude system objects from your search results.
 - Step 5** Check the object **Issues** you want to filter by. If you check more than one issue, objects in any of the categories you check are included in your filter results.
 - Step 6** Check **Ignored** issues if you want to see the object that had issues but was ignored by the administrator.
 - Step 7** Check the required filter in **Shared Objects** if you are filtering for objects shared between two or more devices.
 - **Default Values:** Filters objects having only the default values.

- **Override Values:** Filters objects having overridden values.
- **Additional Values:** Filters objects having additional values.

- Step 8** Check **Unassociated** if you are filtering for objects that are not part of any rule or policy.
- Step 9** Check the **Object Types** you want to filter by.
- Step 10** You can also add an object name, IP address, or port number to the Objects search field to find objects with your search criteria among the filtered results.
-

When to Exclude a Device from Filter Criteria

When adding a device to filtering criteria, the results show you the objects on a device but not the relationships of those objects to other devices. For example, assume **ObjectA** is shared between ASA1 and ASA2. If you were to filter objects to find shared objects on ASA1, you would find **ObjectA** but the **Relationships** pane would only show you that the object is on ASA1.

To see all the devices to which an object is related, don't specify a device in your search criteria. Filter by the other criteria and add search criteria if you choose to. Select an object that CDO identifies and then look in the Relationships pane. You will see all the devices and policies the object is related to.

Unignore Objects

One way to resolve unused, duplicate, or inconsistent objects is to ignore them. You may decide that though an object is [Resolve an Unused Object Issue](#), a [Resolve Duplicate Object Issues](#), or [Resolve Inconsistent Object Issues](#), there are valid reasons for that state and you choose to leave the object issue unresolved. At some point in the future, you may want to resolve those ignored objects. As CDO does not display ignored objects when you search for object issues, you will need to filter the object list for ignored objects and then act on the results.

Procedure

- Step 1** In the CDO navigation bar on the left, click **Objects** and choose an option.
- Step 2** [Object Filters](#).
- Step 3** In the **Object** table, select the object you want to unignore. You can unignore one object at a time.
- Step 4** Click **Unignore** in the details pane.
- Step 5** Confirm your request. Now, when you filter your objects by issue, you should find the object that was previously ignored.
-

Deleting Objects

You can delete a single object or multiple objects.

Delete a Single Object



Caution If cloud-delivered Firewall Management Center is deployed on your tenant:

Changes you make to network objects and groups on the page are reflected in the corresponding cloud-delivered Firewall Management Center network object or group on the **Objects > Other FTD Objects** page. In addition, an entry is created in the **Devices with Pending Changes** page for each on-prem management center with **Discover & Manage Network Objects** enabled, from which you can choose and deploy the changes to the on-prem management center on which you have these objects.

Deleting a network object or group from either page deletes the object or group from both pages.

Procedure

- Step 1** In the CDO navigation bar on the left, choose **Objects** and choose an option.
- Step 2** Locate the object you want to delete by using object filters and the search field, and select it.
- Step 3** Review the **Relationships** pane. If the object is used in a policy or in an object group, you cannot delete the object until you remove it from that policy or group.
- Step 4** In the Actions pane, click the **Remove** icon
- Step 5** Confirm that you want to delete the object by clicking **OK**.
- Step 6** [Preview and Deploy Configuration Changes for All Devices](#) the changes you made, or wait and deploy multiple changes at once.

Delete a Group of Unused Objects

As you onboard devices and start resolving object issues, you find many unused objects. You can delete up to 50 unused objects at a time.

Procedure

- Step 1** Use the **Issues** filter to find **unused** objects. You can also use the Device filter to find objects that are not associated with a device by selecting **No Device**. Once you have filtered the object list, the object checkboxes appear.
- Step 2** Check the **Select all** checkbox in the object table header to select all the objects found by the filter that appear in the object table; or, check individual checkboxes for individual objects you want to delete.
- Step 3** In the Actions pane, click the **Remove** icon .
- Step 4** [Preview and Deploy Configuration Changes for All Devices](#) now the changes you made, or wait and deploy multiple changes at once.

Network Objects

A **network object** can contain a host name, a network IP address, a range of IP addresses, a fully qualified domain name (FQDN), or a subnetwork expressed in CIDR notation. **Network groups** are collections of network objects and other individual addresses or subnetworks you add to the group. Network objects and network groups are used in access rules, network policies, and NAT rules. You can create, update, and delete network objects and network groups using CDO.

Reusing Network Objects Across Products

If you have a Cisco Defense Orchestrator tenant with a cloud-delivered Firewall Management Center and one or more on-prem management centers onboarded to your tenant:

- When you create a Secure Firewall Threat Defense, FDM-managed threat defense, ASA, or Meraki network object or group, a copy of the object is also added to the objects list on the **Objects > Other FTD Objects** page used when configuring cloud-delivered Firewall Management Center, and vice versa.
- When you create a Secure Firewall Threat Defense, FDM-managed threat defense, or ASA network object or group, an entry is created in the **Devices with Pending Changes** page for each On-Prem Firewall Management Center for which **Discover & Manage Network Objects** is enabled. From this list, you can choose and deploy the object to the on-prem management center on which you want to use the object and discard the ones that you do not want. Navigate **Tools & Services > Firewall Management Center**, select the on-prem management center, and click **Objects** to see your objects in the On-Prem Firewall Management Center user interface and assign them to policies.

Changes you make to network objects or groups on either page apply to the object or group instance on both pages. Deleting an object from one page also deletes the corresponding copy of the object from the other page.

Exceptions:

- If a network object of the same name already exists for cloud-delivered Firewall Management Center, the new Secure Firewall Threat Defense, FDM-managed threat defense, ASA, or Meraki network object will not be replicated on the **Objects > Other FTD Objects** page of Cisco Defense Orchestrator
- Network objects and groups in onboarded threat defense devices that are managed by on-premises Secure Firewall Management Center are not replicated on the **Objects > Other FTD Objects** page and cannot be used in cloud-delivered Firewall Management Center.

Note that for on-premises Secure Firewall Management Center instances that have been *migrated* to cloud-delivered Firewall Management Center, network objects and groups *are* replicated to the CDO objects page if they are used in policies that were deployed to FTD devices.

- Sharing Network Objects between CDO and cloud-delivered Firewall Management Center is automatically enabled on new tenants but must be requested for existing tenants. If your network objects are not being shared with cloud-delivered Firewall Management Center, [How CDO Customers Open a Support Ticket with TAC](#) to have the features enabled on your tenant.
- Sharing network objects between CDO and On-Prem Management Center is not automatically enabled on CDO for new on-prem management centers onboarded to CDO. If your network objects are not being shared with On-Prem Management Center, ensure **Discover & Manage Network Objects** toggle button is enabled for the on-prem management center in **Settings** or [How CDO Customers Open a Support Ticket with TAC](#) to have the features enabled on your tenant.

Viewing Network Objects

Network objects you create using CDO and those CDO recognizes in an onboarded device's configuration are displayed on the Objects page. They are labeled with their object type. This allows you to filter by object type to quickly find the object you are looking for.

When you select a network object on the Objects page, you see the object's values in the Details pane. The Relationships pane shows you if the object is used in a policy and on what device the object is stored.

When you click on a network group you see the contents of that group. The network group is a conglomerate of all the values given to it by the network objects.

Service Objects

Protocol Objects

Protocol objects are a type of service object that contain less-commonly used or legacy protocols. Protocol objects are identified by a name and [protocol number](#). CDO recognizes these objects in ASA and Firepower (FDM-managed device) configurations and gives them their own filter of "Protocols" so you can find them easily.

ICMP Objects

An Internet Control Message Protocol (ICMP) object is a service object specifically for ICMP and IPv6-ICMP messages. CDO recognizes these objects in ASA and Firepower configurations when those devices are onboarded and CDO gives them their own filter of "ICMP" so you can find the objects easily.

Using CDO, you can rename or remove ICMP objects from an ASA configuration. You can use CDO to create, update, and delete ICMP and ICMPv6 objects in a Firepower configuration.



Note For the ICMPv6 protocol, AWS does not support choosing specific arguments. Only rules that allow all ICMPv6 messages are supported.

Related Information:

- [Deleting Objects, on page 94](#)



CHAPTER 2

Onboard Devices and Services

You can onboard both live devices and model devices to CDO. Model devices are uploaded configuration files that you can view and edit using CDO.

Most live devices and services require an open HTTPS connection so that the Secure Device Connector can connect CDO to the device or service.

See [Secure Device Connector, on page 8](#) for more information on the SDC and its state.

This chapter covers the following sections:

- [Onboard an SSH Device, on page 99](#)

Onboard an SSH Device

You can use the username and password of a highly privileged user stored on the SSH device to onboard the device.

Onboard an SSH Device

Before you begin

Before you begin, make sure you have met these prerequisites:

- Ensure that the ciphers your Cisco SSH device supports are supported by CDO. At this time, CDO supports a limited set of ciphers for onboarding Cisco SSH devices. The supported ciphers are: `aes128-ctr`, `aes192-ctr`, `aes256-ctr`, `aes128-gcm`, `aes128-gcm@openssh.com`, `aes256-gcm`, `aes256-gcm@openssh.com`. To determine the ciphers your server supports, log in to your SDC and run this command: `ssh -vv <ip_address>`.
- You must have an on-premises Secure Device Connector (SDC) in your network to onboard a Cisco IOS device. See [Secure Device Connector, on page 8](#) for a discussion of SDCs and links to deployment scenarios.
- Before you onboard your device, review [Connect Cisco Defense Orchestrator to your Managed Devices](#).

Procedure

- Step 1** In the navigation pane, click **Inventory** page.
- Step 2** Click the blue plus button  to onboard a device.
- Step 3** Click the **Integrations** tile. If it is grayed-out, it means you do not have an active Secure Device Connector deployed in your network and used by your CDO tenant.
- Step 4** Click the [Secure Device Connector, on page 8](#) button and select the SDC in your network that this device will communicate with. The default SDC is displayed but you can change it by clicking the SDC name.
- Step 5** Give the device a name.
- Step 6** In the Integrations drop-down menu, select **Generic SSH**.
- Step 7** Enter the device's location as either the FQDN or IPv4 address. The default SSH port is 22.
- Step 8** Click **Go**. CDO locates the device and prepares to integrate the configuration.
- Step 9** **Download** the SSH fingerprint and save locally. If you've never connected to this device through SSH before, this fingerprint allows you to confirm the device.
- Step 10** Enter the Username and Password login credentials for the device you are onboarding. CDO cannot successfully read the existing configuration without the correct login information.
- Step 11** (Optional) Enter the **Enable Password** if you've previously configured one for this device.
- Step 12** (Optional) Select a Configuration Command from the drop-down menu, or enter a custom command in the textbox. This command will be used as the configuration for the device; if OOB is enabled, CDO checks for changes and you can view the current value of this in the Configuration page. Note that you can change this command once the device is successfully onboarded to CDO.
- Step 13** Click **Connect**.
- Note** If the login credentials were incorrect, you will be prompted to review the connection details. Here you can re-enter the login information. If you exit the review without correcting the credentials, the device has an integration instance in the **Inventory** page but the device is not onboarded or synchronized.
- Step 14** (Optional) Add labels to this device.
- Step 15** Click **Continue**.
- Step 16** The device onboards to CDO. Click **Finish**.
- Step 17** Return to the **Inventory** page. After the device has been successfully onboarded, you will see that the Configuration Status is "Synced" and the Connectivity state is "Online."
- Note** Once a device is onboarded, you can change the configuration command to be executed. You can use a custom command or create a [CLI macro](#).
- Step 18** (Optional) If you want you can write a note about the device by typing it in the device's Notes page. See [Write a Device Note](#) for more information.

Related Information:

- [Command Line Interface Macros](#)
- [Read Changes from Cisco IOS or SSH to CDO, on page 117](#)

- [About Device Configuration Changes](#)

Delete a Device from CDO

Use the following procedure to delete a device from CDO:

Procedure

- Step 1** Log into CDO.
 - Step 2** Navigate to the **Inventory** page.
 - Step 3** Locate the device you want to delete and check the device in the device row to select it.
 - Step 4** In the Device Actions panel located to the right, select **Remove**.
 - Step 5** When prompted, select **OK** to confirm the removal of the selected device. Select **Cancel** to keep the device onboarded.
-



CHAPTER 3

Managing SSH Devices using Cisco Defense Orchestrator

Cisco Defense Orchestrator (CDO) allows you to manage devices through SSH. These are the features we support for those devices:

- Onboard a SSH Device. You can use the username and password of a highly privileged user stored on the SSH device to onboard the device.
 - Viewing the device configuration. You can view the device configuration file.
 - Review policy and configuration changes from device. When you read the configuration file from the SSH device, it will be saved in CDO's database.
 - Out-of-band change detection. When you enable Conflict Detection, CDO checks the device every 10 minutes for changes to the device's configuration. If there is a change, the device's status will change to Conflict Detected and you will be able to resolve the conflict.
 - Command line interface support. You can issue all SSH device commands to the device through CDO's command line interface.
 - Individual CLI commands and groups of commands can be turned into editable and reusable "macros." You can use the system-defined macros provided by CDO and create your own macros for tasks you perform often.
 - Detect and manage SSH fingerprint changes. If any credentials or properties of the device change, and that causes a change to the SSH fingerprint, CDO detects that change and gives you a chance to review and accept the new fingerprint.
 - Change Log. The change log captures all the commands you issue to the SSH device.
- [CDO Command Line Interface, on page 104](#)
 - [Bulk Command Line Interface, on page 105](#)
 - [Command Line Interface Macros, on page 109](#)
 - [Export CDO CLI Command Results, on page 113](#)
 - [About Device Configuration Changes, on page 115](#)
 - [Read All Device Configurations, on page 116](#)
 - [Read Changes from Cisco IOS or SSH to CDO, on page 117](#)
 - [Preview and Deploy Configuration Changes for All Devices, on page 118](#)
 - [Bulk Deploy Device Configurations, on page 119](#)

- [About Scheduled Automatic Deployments](#), on page 119
- [Check for Configuration Changes](#), on page 122
- [Discard Configuration Changes](#), on page 123
- [Out-of-Band Changes on Devices](#), on page 123
- [Synchronizing Configurations Between Defense Orchestrator and Device](#), on page 124
- [Conflict Detection](#), on page 124
- [Automatically Accept Out-of-Band Changes from your Device](#), on page 125
- [Resolve Configuration Conflicts](#), on page 126
- [Schedule Polling for Device Changes](#), on page 128

CDO Command Line Interface

CDO provides users with a command line interface (CLI) for managing , SSH-managed devices. Users can send commands to a single device or to multiple devices simultaneously.

Using the Command Line Interface

Procedure

- Step 1** Open the **Inventory** page.
- Step 2** Click the **Devices** button above the Inventory table.
- Step 3** Use the device tabs and filter button to find the device you want to manage using the command line interface (CLI).
- Step 4** Select the device.
- Step 5** In the **Device Actions** pane, click **>_Command Line Interface**.
- Step 6** Click the **Command Line Interface** tab.
- Step 7** Enter your command, or commands, in the command pane and click **Send**. The device's response to the command(s) are displayed below in the "response pane."

Note If there are limitations on the commands you can run, those limitations are listed above the command pane.

Related Topics

[Entering Commands in the Command Line Interface](#), on page 104

Entering Commands in the Command Line Interface

A single command can be entered on a single line or several commands can be entered sequentially on several lines and CDO will execute them in order. The following ASA example sends a batch of commands which creates three network objects and a network object group that contains those network objects.

```

> object network email_server_north
host 192.168.10.2
object network email_server_south
host 192.168.20.2
object network email_server_headquarters
host 192.168.30.2
object-group network email_servers_all
network-object object email_server_north
network-object object email_server_south
network-object object email_server_headquarters

```

Press Cmd+Enter to send command

Work with Command History

After you send a CLI command, CDO records that command in the history pane on the **Command Line Interface** page. You can rerun the commands saved in the history pane or use the commands as a template:

Procedure

- Step 1** On the **Inventory** page, select the device you want to configure.
- Step 2** Click the **Devices** tab to locate the device.
- Step 3** Click the appropriate device type tab.
- Step 4** Click **>_Command Line Interface**.
- Step 5** Click the clock icon  to expand the history pane if it is not already expanded.
- Step 6** Select the command in the history pane that you want to modify or resend.
- Step 7** Reuse the command as it is or edit it in the command pane and click **Send**. CDO displays the results of the command in the response pane.

Note CDO displays the `Done!` message in the response pane in two circumstances:

- After a command has executed successfully.
- When the command has no results to return. For example, you may issue a show command with a regular expression searching for a configuration entry. If there is no configuration entry that meets the criteria of the regular expression, CDO returns `Done!`.

Bulk Command Line Interface

CDO offers users the ability to manage Secure Firewall ASA, FDM-managed Threat Defense, SSH, and Cisco IOS devices using a command-line interface (CLI). Users can send commands to a single device or to multiple devices of the same kind simultaneously. This section describes sending CLI commands to multiple devices at once.

Bulk CLI Interface



Note CDO displays the **Done!** message in two circumstances:

- After a command has executed successfully without errors.
- When the command has no results to return. For example, you may issue a show command with a regular expression searching for a certain configuration entry. If there is no configuration entry that meets the criteria of the regular expression, CDO returns **Done!**.

Number	Description
1	Click the clock to expand or collapse the command history pane.
2	Command history. After you send a command, CDO records the command in this history pane so you can return to it, select it, and run it again.
3	Command pane. Enter your commands at the prompt in this pane.
4	<p>Response pane. CDO displays the device's response to your command as well as CDO messages. If the response was the same for more than one device, the response pane displays the message "Showing Responses for X devices." Click X devices and CDO displays all the devices that returned the same response to the command.</p> <p>Note CDO displays the Done! message in two circumstances:</p> <ul style="list-style-type: none"> • After a command has executed successfully without errors. • When the command has no results to return. For example, you may issue a show command with a regular expression searching for a certain configuration entry. If there is no configuration entry that meets the criteria of the regular expression, CDO returns Done!.

Number	Description
5	My List tab displays the devices you chose from the Inventory table and allows you to include or exclude devices you want to send a command to.
6	The Execution tab, highlighted in the figure above, displays the devices in the command that is selected in the history pane. In this example, the show run grep user command is selected in the history pane and the Execution tab shows that it was sent to 10.82.109.160, 10.82.109.181, and 10.82.10.9.187.
7	Clicking the By Response tab shows you the list of responses generated by the command. Identical responses are grouped together in one row. When you select a row in the By Response tab, CDO displays the response to that command in the response pane.
8	Clicking the By Device tab displays individual responses from each device. Clicking one of the devices in the list allows you to see the response to the command from a specific device.

Send Commands in Bulk

Procedure

-
- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab to locate the devices.
 - Step 3** Select the appropriate device tab and use the filter button to find the devices you want to configure using the command line interface.
 - Step 4** Select the devices.
 - Step 5** in the **Device Actions** pane, click **>_Command Line Interface**.
 - Step 6** You can check or uncheck devices you want to send the commands to in the **My List** field.
 - Step 7** Enter your commands in the command pane and click **Send**. The command output is displayed in the response pane, the command is logged in the Change Log, and the command CDO records your command in the History pane in the Bulk CLI window.
-

Work with Bulk Command History

After you send a bulk CLI command, CDO records that command in the [Bulk CLI Interface](#) history page. You can rerun the commands saved in the history pane or use the commands as a template. The commands in the history pane are associated with the original devices on which they were run.

Procedure

-
- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab to locate devices.
 - Step 3** Click the appropriate device type tab and click the filter icon to find the devies you want to configure.

- Step 4** Select the devices.
- Step 5** Click **Command Line Interface**.
- Step 6** **Select** the command in the History pane that you want to modify or resend. Note that the command you pick is associated with specific devices and not necessarily the ones you chose in the first step.
- Step 7** Look at the My List tab to make sure the command you intend to send will be sent to the devices you expect.
- Step 8** Edit the command in the command pane and click **Send**. CDO displays the results of the command in the response pane.

Work with Bulk Command Filters

After you run a bulk CLI command you can use the **By Response** filter and the **By Device** filter to continue to configure the devices.

By Response Filter

After running a bulk command, CDO populates the **By Response** tab with a list of responses returned by the devices that were sent the command. Devices with identical responses are consolidated in a single row. Clicking a row in the **By Response** tab displays the response from the device(s) in the response pane. If the response pane shows a response for more than one device, it displays the message "Showing Responses for X devices." Click **X devices** and CDO displays all the devices that returned the same response to the command.



To send a command to the list of devices associated with a command response, follow this procedure:

Procedure

- Step 1** Click the command symbol in a row in the **By Response** tab.
- Step 2** Review the command in the command pane and click **Send** to resend the command or click **Clear** to clear the command pane and enter a new command to send to the devices and then click **Send**.
- Step 3** Review the responses you receive from your command.
- Step 4** If you are confident that the running configuration file on the devices you chose reflects your change, type `write memory` in the command pane and click **Send**. This saves your running configuration to the startup configuration.

By Device Filter

After running a bulk command, CDO populates the the Execution tab and the By Device tab with the list of devices that were sent the command. Clicking a row in the By Device tab displays the response for each device.

To run a command on that same list of devices, follow this procedure:

Procedure

-
- Step 1** Click the **By Device** tab.
 - Step 2** Click **>_Execute a command on these devices**.
 - Step 3** Click **Clear** to clear the command pane and enter a new command.
 - Step 4** In the My List pane, specify the list of devices you want to send the command to by checking or unchecking individual devices in the list.
 - Step 5** Click **Send**. The response to the command is displayed in the response pane. If the response pane shows a response for more than one device, it displays the message "Showing Responses for X devices." Click X devices and CDO displays all the devices that returned the same response to the command.
 - Step 6** If you are confident that the running configuration file on the devices you chose reflects your change, type `write memory` in the command pane and click **Send**.
-

Command Line Interface Macros

A CLI macro is a fully-formed CLI command ready to use, or a template of a CLI command you can modify before you run it. All macros can be run on one or more SSH devices simultaneously.

Use CLI macros that resemble templates to run the same commands on multiple devices at the same time. CLI macros promote consistency in your device configurations and management. Use fully-formed CLI macros to get information about your devices. There are different CLI macros that are immediately available for you to use on your SSH devices.

You can create CLI macros for monitoring tasks that you perform frequently. See [Create a CLI Macro from a New Command](#) for more information.

CLI macros are system-defined or user-defined. System-defined macros are provided by CDO and can not be edited or deleted. User-defined macros are created by you and can be edited or deleted.



Note You can only create macros for a device once it has been onboarded to CDO.

Using the ASA as an example, if you want to find a particular user on one of your ASAs, you could run this command:

```
show running-config | grep username
```

When you run the command, you would replace *username* with the username of the user you are searching for. To make a macro out of this command, use the same command and put curly braces around *username*.

```
> show running-config | grep {{username}}
```

You can name your parameters anything you want. You can also create the same macro with this parameter name:

```
> show running-config | grep {{username_of_local_user_stored_on_asa}}
```

The parameter name can be descriptive and must use alphanumeric characters and underlines. The command syntax, in this case the

```
show running-config | grep
```

part of the command, must use proper CLI syntax for the device you are sending the command to.

Create a CLI Macro from a New Command

Procedure

- Step 1** Before you create a CLI macro, test the command in CDO's Command Line Interface to make sure the command syntax is correct and it returns reliable results.
- Note**
- Step 2** In the navigation bar, click **Inventory**.
- Step 3** Click the **Devices** tab to locate the device.
- Step 4** Click the appropriate device type tab and select an online and synced device.
- Step 5** Click **>_Command Line Interface**.
- Step 6** Click the CLI macro favorites star  to see what macros already exist.
- Step 7** Click the the plus button .
- Step 8** Give the macro a unique name. Provide a description and notes for the CLI macro if you wish.
- Step 9** Enter the full command in the **Command** field.
- Step 10** Replace the parts of the command that you would want to modify, when you run the command, with a parameter name surrounded by curly braces.
- Step 11** Click **Create**. The macro you create is available for use on all the devices of that type, not just the one you initially specified.
- To run the command see, [Run a CLI Macro](#).
-

Create a CLI Macro from CLI History or from an Existing CLI Macro

In this procedure, you are going to create a user-defined macro from a command you have already run, another user-defined macro, or from a system-defined macro.

Procedure

- Step 1** In the navigation bar, click **Inventory**.

Note If you want to create a user-defined macro from CLI history, select the device on which you ran the command. CLI macros are shared across devices on the same account but not CLI history.

Step 2 Click the **Devices** tab.

Step 3 Click the appropriate device type tab and select an online and synced device.

Step 4 Click **>_Command Line Interface**.

Step 5 Find the command you want to make a CLI macro from and select it. Use one of these methods:

- Click the clock  to view the commands you have run on that device. Select the one you want to turn into a macro and the command appears in the command pane.
- Click the CLI macro favorites star  to see what macros already exist. Select the user-defined or system-defined CLI macro you want to change. The command appears in the command pane.

Step 6 With the command in the command pane, click the CLI macro gold star . The command is now the basis for a new CLI macro.

Step 7 Give the macro a unique name. Provide a description and notes for the CLI macro if you wish.

Step 8 Review the command in the Command field and make the changes you want.

Step 9 Replace the parts of the command that you would want to modify, when you run the command, with a parameter name surrounded by curly braces.

Step 10 Click **Create**. The macro you create is available for use on all the devices of that type, not just the one you initially specified.

To run the command see, [Run a CLI Macro](#).

Run a CLI Macro

Procedure

Step 1 In the navigation bar, click **Inventory**.

Step 2 Click the **Devices** tab.

Step 3 Click the appropriate device type tab and select one or more devices.

Step 4 Click **>_Command Line Interface**.

Step 5 In the command panel, click the star .

Step 6 Select a CLI macro from the command panel.

Step 7 Run the macro one of two ways:

- If the macro has no parameters to define, click **Send**. The response to the command appears in the response pane. You're done.
- If the macro contains parameters, such as the Configure DNS macro below, click **>_ View Parameters**.

```

★ Using Macro: Configure DNS
> dns domain-lookup {{IF_NAME}}
  dns server-group DefaultDNS
  name-server {{IP_ADDR}}

```

Step 8 In the Parameters pane, fill in the values for the parameters in the Parameters fields.

Parameters
✕

Parameters	Payload
IF_NAME <input style="width: 100%;" type="text" value="outside"/>	<pre>dns domain-lookup outside dns server-group DefaultDNS name-server 208.67.220.220</pre>
IP_ADDR <input style="width: 100%;" type="text" value="208.67.220.220"/>	

Step 9 Click **Send**. After CDO has successfully sent the command and updated the device's configuration, you receive the message, Done!

Step 10 After you send the command you may see the message, "Some commands may have made changes to the running config" along with two links.

⚠ Some commands may have made changes to the running config [Write to Disk](#) [Dismiss](#)

- Clicking **Write to Disk** saves the changes made by this command, and any other change that in the running config, to the device's startup config.
- Clicking **Dismiss**, dismisses the message.

Edit a CLI Macro

You can edit user-defined CLI macros but not system-defined macros. Editing a CLI macro changes it for all your SSH devices. Macros are not specific to a particular device.

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab.
- Step 3** Click the appropriate device type tab.
- Step 4** Select your device.
- Step 5** Click **Command Line Interface**.
- Step 6** Select the user-defined macro you want to edit.
- Step 7** Click the edit icon in the macro label.
- Step 8** Edit the CLI macro in the Edit Macro dialog box.

- Step 9** Click **Save**.
See [Run a CLI Macro](#) for instructions on how to run the CLI macro.
-

Delete a CLI Macro

You can delete user-defined CLI macros but not system-defined macros. Deleting a CLI macro deletes it for all your devices. Macros are not specific to a particular device.

Procedure

- Step 1** In the navigation bar, click **Inventory**.
Step 2 Click the **Devices** tab.
Step 3 Click the appropriate device type tab.
Step 4 Select your device.
Step 5 Click **>_Command Line Interface**.
Step 6 Select the user-defined CLI macro you want to delete.
Step 7 Click the trash can icon  in the CLI macro label.
Step 8 Confirm you want to remove the CLI macro.
-

Export CDO CLI Command Results

You can export the results of CLI commands issued to a standalone device, or several devices, to a comma separated value (.csv) file so you can filter and sort the information in it however you like. You can export the CLI results of a single device, or many devices at once. The exported information contains the following:

- Device
- Date
- User
- Command
- Output

Export CLI Command Results

You can export the results of commands you have just executed in the command window to a .csv file:

Procedure

- Step 1** In the navigation bar, click **Inventory**.

- Step 2** Click the **Devices** tab.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select the device or devices so they are highlighted.
 - Step 5** In the **Device Actions** pane for the device, click > **Command Line Interface**.
 - Step 6** In the command line interface pane, enter a command and click **Send** to issue it to the device.
 - Step 7** To the right of the window of entered commands, click the export icon .
 - Step 8** Give the .csv file a descriptive name and save the file to your local file system. When reading the command output on the .csv file, expand all the cells to see all the results of the command.
-

Export the Results of CLI Macros

You can export the results of macros that have been executed in the command window. Use the following procedure to export to a .csv file, the results of CLI macros executed on one or multiple devices:

Procedure

- Step 1** Open the **Inventory** page.
 - Step 2** Click the **Devices** tab.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select the device or devices so they are highlighted.
 - Step 5** In the **Device Actions** pane for the device, click > **Command Line Interface**.
 - Step 6** In the left pane of the CLI window, select the CLI macro favorites star .
 - Step 7** Click on the macro command you want to export. Fill in any appropriate parameters and click **Send**.
 - Step 8** To the right of the window of entered commands, click the export icon .
 - Step 9** Give the .csv file a descriptive name and save the file to your local file system. When reading the command output on the .csv file, expand all the cells to see all the results of the command.
-

Export the CLI Command History

Use the following procedure to export the CLI history of one or multiple devices to a .csv file:

Procedure

- Step 1** In the navigation pane, click **Inventory**.
- Step 2** Click the **Devices** tab.
- Step 3** Click the appropriate device type tab.
- Step 4** Select the device or devices so they are highlighted.
- Step 5** In the Device Actions pane for the device, click > **Command Line Interface**.

- Step 6** Click the **Clock** icon  to expand the history pane if it is not already expanded.
- Step 7** To the right of the window of entered commands, click the export icon .
- Step 8** Give the .csv file a descriptive name and save the file to your local file system. When reading the command output on the .csv file, expand all the cells to see all the results of the command.

Related Information:

- [CDO Command Line Interface, on page 104](#)
- [Create a CLI Macro from a New Command](#)
- [Delete a CLI Macro](#)
- [Edit a CLI Macro](#)
- [Run a CLI Macro](#)
- [Bulk Command Line Interface](#)

Export the CLI Macro List

You can only export macros that have been executed in the command window. Use the following procedure to export the CLI macros of one or multiple devices to a .csv file:

Procedure

-
- Step 1** In the navigation pane, click **Inventory**.
- Step 2** Click the **Devices** tab.
- Step 3** Click the appropriate device type tab.
- Step 4** Select the device or devices so they are highlighted.
- Step 5** In the Device Actions pane for the device, click **>_Command Line Interface**.
- Step 6** In the left pane of the CLI window, select the CLI macro favorites star .
- Step 7** Click on the macro command you want to export. Fill in any appropriate parameters and click **Send**.
- Step 8** To the right of the window of entered commands, click the export icon .
- Step 9** Give the .csv file a descriptive name and save the file to your local file system.
-

About Device Configuration Changes

In order to manage a device, CDO must have its own copy of the device's configuration stored in its local database. When CDO "reads" a configuration from a device it manages, it takes a copy of the device's configuration and saves it. The first time CDO reads and saves a copy of a device's configuration is when the device is onboarded. These choices describe reading a configuration for different purposes:

- **Discard Changes:** This action is available when a device's configuration status is "Not Synced." In the Not Synced state, there are changes to the device's configuration pending on CDO. This option allows you to undo all pending changes. The pending changes are deleted and CDO overwrites its copy of the configuration with copy of the configuration stored on the device.
- **Check for Changes:** This action is available if the device's configuration status is Synced. Clicking Checking for Changes directs CDO to compare its copy of the device's configuration with the copy of the configuration stored on the device. If there is a difference, CDO immediately overwrites its copy of the device's configuration with the copy stored on the device.
- **Review Conflict and Accept Without Review:** If you have enabled [Conflict Detection](#) on a device, CDO checks for configuration changes made on the device every 10 minutes. If the copy of the configuration stored on the device has changed, CDO notifies you by displaying the "Conflict Detected" configuration status.
 - **Review Conflict:** Click Review Conflict allows you to review changes made directly on a device and accept or reject them.
 - **Accept Without Review:** This action overwrites CDO's copy of a device's configuration with the latest copy of the configuration stored on the device. CDO does not prompt you to confirm the differences in the two copies of the configuration before taking the overwriting action.

Read All: This is a bulk operation. You can select more than one device, in any state, and click **Read All** to overwrite all the devices' configurations stored on CDO with the configurations stored on the devices.

- **Deploy Changes:** As you make changes to a device's configuration, CDO saves the changes you make to its own copy of the configuration. Those changes are "pending" on CDO until they are deployed to the device. When there are changes to a device's configuration that have not been deployed to the device, the device is in the Not Synced configuration state.

Pending configuration changes have no effect on the network traffic running through the device. Only after CDO deploys the changes to the device do they have an effect. When CDO deploys changes to the device's configuration, it only overwrites those elements of the configuration that were changed. It does not overwrite the entire configuration file stored on the device. Deployments can be initiated for a single device or on more than one device simultaneously.

- **Discard All** is an option that is only available after you click **Preview and Deploy...** After clicking Preview and Deploy, CDO shows you a preview of the pending changes in CDO. Clicking **Discard All** deletes all pending changes from CDO and does not deploy anything to the selected device(s). Unlike "Discard Changes" above, deleting the pending changes is the end of the operation.

Read All Device Configurations

If a configuration change is made to a device outside of Cisco Defense Orchestrator (CDO), the device's configuration stored on CDO and the device's local copy of its configuration are no longer the same. You may want to overwrite CDO's copy of the device's configuration with the configuration stored on the device to make the configurations the same again. You can perform this task on many devices simultaneously using the **Read All** link.

See [About Device Configuration Changes](#) for more information about how CDO manages the two copies of the device's configuration.

Here are three configuration statuses where clicking **Read All** will overwrite CDO's copy of the device's configuration with the device's copy of the configuration.

- **Conflict Detected**-If conflict detection is enabled, CDO polls the devices it manages every 10 minutes for changes made to their configurations. If CDO finds that the configuration on the device has changed, CDO displays a "Conflict detected" configuration status for the device.
- **Synced**-If the device is in a synced state, and you click **Read All**, CDO immediately checks the devices to determine if there have been any changes made to its configurations directly. After clicking **Read All**, CDO confirms your intent to overwrite its copy of the device's configuration and then CDO performs the overwrite.
- **Not Synced**-If the device is in the Not Synced state, and you click **Read All**, CDO warns you that there are pending changes made to the device's configuration using CDO and that proceeding with the Read All operation will delete those changes and then overwrite CDO's copy of the configuration with the configuration on the device. This Read All functions like [Discard Configuration Changes](#).

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab.
- Step 3** Click the appropriate device type tab.
- Step 4** (Optional) Create a [Change Request Management](#) to identify the results of this bulk action easily in the Change Log.
- Step 5** Select the devices whose configurations you want to save CDO. Notice that CDO only provides command buttons for actions that can be applied to all the selected devices.
- Step 6** Click **Read All**.
- Step 7** CDO warns you if there are configuration changes staged on CDO, for any of the devices you selected, and asks if you want to continue with the bulk reading configurations action. Click **Read All** to continue.
- Step 8** Look at the [Monitor Jobs in CDO](#) for the progress of the Read All configurations operation. If you want more information about how individual actions in the bulk operation succeeded or failed, click the blue Review link and you will be directed to the [Monitor Jobs in CDO](#).
- Step 9** If you created and activated a change request label, remember to clear it so that you don't inadvertently associate other configuration changes with this event.

Related Information

- [About Device Configuration Changes](#)
- [Discard Configuration Changes](#)
- [Check for Configuration Changes](#)

Read Changes from Cisco IOS or SSH to CDO

In order to manage a Cisco IOS or SSH device, CDO must have its own stored copy of the device's configuration file. The first time CDO reads and saves a copy of the device's configuration file is when the device is

onboarded. Subsequently, when CDO checks the configuration from the device, it takes a copy of the device's configuration file and *completely overwrites* the copy of the configuration file it maintains in its own database. See [About Device Configuration Changes](#), for more information about how CDO manages the copy of the device configuration stored on CDO and the one stored on the device.

See [Check for Configuration Changes](#) to learn how to detect changes made directly to the Cisco IOS or SSH device outside of CDO.

See [Discard Configuration Changes](#) to learn how to "undo" configuration changes you have started to make on CDO but have not deployed to the IOS or SSH device.

Preview and Deploy Configuration Changes for All Devices

CDO informs you when you have made a configuration change to a device on your tenant, but you have not deployed that change, by displaying an orange dot on the Deploy icon



. The devices affected by these changes show the status "Not Synced" in the Devices and **Services** page. By clicking **Deploy**, you can review which devices have pending changes and deploy the changes to those devices.



Note For every new FDM or FTD network object or group that you create and make changes to, CDO creates an entry in this page for all on-prem management centers that are managed by CDO.

This deployment method is available for all supported devices.

You can use this deployment method for single configuration changes or wait and deploy multiple changes at once.

Procedure

- Step 1** In the top right corner of the screen, click the **Deploy** icon .
- Step 2** Select the devices with changes you want to deploy. If a device has a yellow caution triangle, you can not deploy changes to that device. Hover your mouse over the yellow caution triangle to find out why you can't deploy changes to that device.
- Step 3** (Optional) If you want to see more information about a pending change, click the **View Detailed Changelog** link to open the change log associated with that change. Click the **Deploy** icon to return to the **Devices with Pending Changes** page.
- Step 4** (Optional) [Change Request Management](#) to track your changes without leaving the **Devices with Pending Changes** page.
- Step 5** Click **Deploy Now** to deploy the changes immediately to the devices you selected. You'll see the progress in the Active jobs indicator in the Jobs tray.
- Step 6** (Optional) After the deployment has finished, click **Jobs** in the CDO navigation bar. You will see a recent "Deploy Changes" job showing the results of the deployment.

- Step 7** If you created a change request label, and you have no more configuration changes to associate with it, clear it.
-

What to do next

- [About Scheduled Automatic Deployments](#)

Bulk Deploy Device Configurations

If you have made changes to multiple devices, for instance by editing a shared object, you can apply those change to all of the affected devices at once:

Procedure

- Step 1** In the navigation pane, click **Inventory**.
- Step 2** Click the **Devices** tab.
- Step 3** Click the appropriate device type tab.
- Step 4** Select all of the devices for which you have made configuration changes on CDO. These devices should show "Not Synced" status.
- Step 5** Deploy the changes using one of these methods:

- Click the  button at the top-right of the screen to view the **Devices with Pending Changes** window. This gives you a chance to review the pending changes on the devices you selected before you deploy them. Click **Deploy Now** to deploy the changes.

Note If you see a yellow warning triangle next to a device on the **Devices with Pending Changes** screen, you cannot deploy a change to that device. Hover your mouse over the warning triangle for information about why changes cannot be deployed to that device.

- Click **Deploy All**  on the details pane. Review any warnings and click **OK**. The bulk deployment starts immediately without a review of the changes.

- Step 6** (Optional) Click the Jobs icon  in the navigation bar to view the results of the bulk deploy.
-

About Scheduled Automatic Deployments

Using CDO, you can make configuration changes to one or more of the devices it manages and then schedule the changes to be deployed to those devices at a time that is convenient for you.

You can only schedule deployments if you [Enable the Option to Schedule Automatic Deployments, on page 42](#) in the **Tenant Settings** tab of the Settings page. Once this option is enabled, you can create, edit, or delete

scheduled deployments. A scheduled deployment deploys all the staged changes saved on CDO at the date and time set. You can also view and delete scheduled deployments from the Jobs page.

If there were changes made directly to the device that have not been [About Device Configuration Changes](#) to CDO, the scheduled deployment will be skipped until that conflict is resolved. The Jobs page will list any instance where a scheduled deployment fails. If **Enable the Option to Schedule Automatic Deployments** is turned off, all scheduled deployments are deleted.



Caution If you schedule a new deployment for multiple devices, and some of those devices already have deployments scheduled, the new scheduled deployment overwrites the existing scheduled deployments.



Note When you create a scheduled deployment, the schedule is created in your local time, not in the time zone of the device. Scheduled deployments *do not* automatically adjust for daylight savings time.

Schedule an Automatic Deployment

The deployment schedule can be a single event or a recurring event. You may find recurring automatic deployments a convenient way to line up recurring deployments with your maintenance window. Follow this procedure to schedule a one-time or a recurring deployment for a single device:



Note If you schedule a deployment for a device that has an existing deployment scheduled, the new scheduled deployment overwrites the existing deployment.

Procedure

- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select one or more devices.
 - Step 5** In the Device Details pane, locate the Scheduled Deployments tab and click **Schedule**.
 - Step 6** Select when the deployment should occur.
 - For a one-time deployment, click the **Once on** option to select a date and time from the calendar.
 - For a recurring deployment, click the **Every** option. You can choose either a daily or once a week deployment. Select the **Day** and **Time** the deployment should occur.
 - Step 7** Click **Save**.
-

Edit a Scheduled Deployment

Follow this procedure to edit a scheduled deployment:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab.
- Step 3** Click the appropriate device type tab.
- Step 4** Select one or more devices.
- Step 5** In the **Device Details** pane, locate the Scheduled Deployments tab and click **Edit**.



- Step 6** Edit the recurrence, date, or time of a scheduled deployment.
 - Step 7** Click **Save**.
-

Delete a Scheduled Deployment

Follow this procedure to delete a scheduled deployment:



- Note** If you schedule a deployment for multiple devices, and then change or delete the schedule for some of the devices, the original scheduled deployment for the remaining devices will be preserved.
-

Procedure

- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select one or more devices.
 - Step 5** In the **Device Details** pane, locate the Scheduled Deployments tab and click **Delete** .
-

What to do next

- [About Device Configuration Changes](#)
- [Read All Device Configurations, on page 116](#)
- [Preview and Deploy Configuration Changes for All Devices, on page 118](#)

Check for Configuration Changes

Check for Changes to determine if the device's configuration has been changed directly on the device and it is no longer the same as the copy of the configuration stored on CDO. You will see this option when the device is in the "Synced" state.

To check changes:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select the device, whose configuration you suspect may have been changed directly on the device.
 - Step 5** Click **Check for Changes** in the Synced pane on the right.
 - Step 6** The behavior that follows is slightly different depending on the device:
 - For device if there has been a change to the device's configuration, you will receive the message:

```
Reading the policy from the device. If there are active deployments on the device,
reading will start after they are finished.
```

 - Click **OK** to continue. The configuration on the device will overwrite the stored configuration on CDO.
 - Click **Cancel** to cancel the action.
 - For SSH device:
 - a. Compare the two configurations presented to you. Click **Continue**. The configuration labeled **Last Known Device Configuration** is the configuration stored on CDO. The configuration labeled **Found on Device** is the configuration saved on the ASA.
 - b. Select either:
 1. **Reject** the out-of-band changes to keep the "Last Known Device Configuration."
 2. **Accept** the out-of-band changes to overwrite the device's configuration stored in CDO with the configuration found on the device.
 - c. Click **Continue**.
-

Discard Configuration Changes

Click **Discard Changes** when you want to "undo" all the *undeployed* configuration changes you made to a device's configuration using CDO. When you click **Discard Changes**, CDO *completely overwrites* its local copy of a device's configuration with the configuration stored on the device.

When you click **Discard Changes**, your device's configuration status is in a **Not Synced** state. After you discard your changes, the copy of the configuration on CDO will be the same as the copy of the configuration on the device and the configuration status in CDO will return to Synced.

To discard, or "undo," all of your undeployed configuration changes for a device:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select the device you have been making configuration changes to.
 - Step 5** Click **Discard Changes** in the **Not Synced** pane on the right.
 - For FDM-managed devices-CDO warns you that "Pending changes on CDO will be discarded and the CDO configuration for this device will be replaced with the configuration currently running on the device." Click **Continue** to discard your changes.
 - For Meraki devices-CDO deletes the change immediately.
 - For AWS devices-CDO displays what you are about to delete. Click **Accept** or **Cancel**.
-

Out-of-Band Changes on Devices

Out-of-band changes refer to changes made directly on the device without using CDO. These changes may be made using the device's command-line interface over an SSH connection or by using a local manager like the Adaptive Security Device Manager (ASDM) for the ASA, the FDM for the FDM-managed device, or for an On-Prem Firewall Management Center on the On-Prem Firewall Management Center user interface. An out-of-band change causes a conflict between the device's configuration stored on CDO and the configuration stored on the device itself.

Detecting Out-of-Band Changes on Devices

If Conflict Detection is enabled for an ASA, or an FDM-managed device, a Cisco IOS device, or an On-Prem Firewall Management Center, CDO checks the device every 10 minutes searching for any new changes made directly to the device's configuration outside of CDO.

If CDO finds that there are changes to the device's configuration that are not stored on CDO, it changes the **Configuration Status** of that device to the "Conflict Detected" state.

When Defense Orchestrator detects a conflict, one of two conditions is likely:

- There have been configuration changes made to the device directly that have not been saved to CDO's database.
- In the case of an FDM-managed device, there may be "pending" configuration changes on the FDM-managed device that have not been deployed.
- In the case of an On-Prem Firewall Management Center, there may be changes made, for instance, to objects outside CDO, which are pending to be synchronized with CDO or changes made in CDO which are pending to be deployed to the On-Prem Firewall Management Center.

Synchronizing Configurations Between Defense Orchestrator and Device

About Configuration Conflicts

On the **Inventory** page, you may see devices or services have the status "Synced," "Not Synced," or "Conflict Detected." To know the status of an On-Prem Firewall Management Center that you manage using CDO, navigate **Tools & Services > Firewall Management Center**.

- When a device is **Synced**, the configuration on Cisco Defense Orchestrator (CDO) and the configuration stored locally on the device are the same.
- When a device is **Not Synced**, the configuration stored in CDO was changed and it is now different than the configuration stored locally on the device. Deploying your changes from CDO to the device changes the configuration on the device to match CDO's version.
- Changes made to devices outside of CDO are called **out-of-band changes**. When out-of-band changes are made, you'll see the device state change to "Conflict Detected," if conflict detection is enabled for the device. Accepting the out-of-band changes, changes the configuration on CDO to match the configuration on the device.

Conflict Detection

When conflict detection is enabled, Cisco Defense Orchestrator (CDO) polls the device for the default interval to determine if a change has been made to the device's configuration outside of CDO. If CDO detects that a change was made, it changes the configuration status for the device to **Conflict Detected**. Changes made to a device outside of CDO are called "out-of-band" changes.

In the case of an On-Prem Firewall Management Center that is managed by CDO, if there are changes that are staged and the device is in **Not Synced** state, CDO stops polling the device to check for changes. When there are changes made outside CDO which are pending to be synchronized with CDO and changes made in CDO which are pending to be deployed to the on-prem management center, CDO declares the on-prem management center to be in the **Conflict Detected** state.

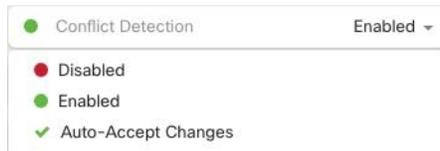
Once this option is enabled, you can configure how often conflicts or OOB changes are detected per device. See [Schedule Polling for Device Changes, on page 128](#) for more information.

Enable Conflict Detection

Enabling conflict detection alerts you to instances where changes have been made to a device outside of Defense Orchestrator.

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab.
- Step 3** Select the appropriate device type tab.
- Step 4** Select the device or devices for which you want to enable conflict detection.
- Step 5** In the **Conflict Detection** box at the right of the device table, select **Enabled** from the list.



Automatically Accept Out-of-Band Changes from your Device

You can configure Cisco Defense Orchestrator (CDO) to automatically accept any change made directly to a managed device by enabling auto-accept changes. Changes made directly to a device without using CDO are referred to as out-of-band changes. An out-of-band change creates a *conflict* between the device's configuration stored on CDO and the configuration stored on the device itself.

The auto-accept changes feature is an enhancement to conflict detection. If you have auto-accept changes enabled on your device, CDO checks for changes every 10 minutes to determine if there have been any out-of-band changes made to the device's configuration. If there have been configuration changes, CDO automatically updates its local version of the device's configuration without prompting you.

CDO will *not* automatically accept a configuration change if there are configuration changes made on CDO that have not yet been deployed to the device. Follow the prompts on the screen to determine your next action.

To use auto-accept changes, you first enable the tenant to display the auto-accept option in the Conflict Detection menu on the **Inventory** page; then, you enable auto-accept changes for individual devices.

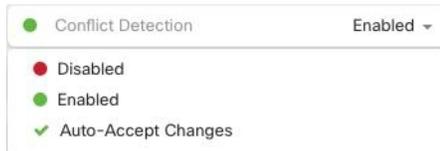
If you want CDO to detect out-of-band changes but give you the option to accept or reject them manually, enable [Conflict Detection, on page 124](#) instead.

Configure Auto-Accept Changes

Procedure

- Step 1** Log in to CDO using an account with Admin or Super Admin privileges.

- Step 2** From the CDO menu, navigate to **Settings > General Settings**
- Step 3** In the **Tenant Settings** area, click the toggle to "**Enable the option to auto-accept device changes.**" This enables the Auto-Accept Changes menu option to appear in the Conflict Detection menu on the **Inventory** page.
- Step 4** Open the **Inventory** page and select the device for which you want to automatically accept out-of-band changes.
- Step 5** In the **Conflict Detection** menu, select **Auto-Accept Changes** in the drop-down menu.



Disabling Auto-Accept Changes for All Devices on the Tenant

Procedure

- Step 1** Log-in to CDO using an account with Admin or Super Admin privileges.
- Step 2** From the CDO menu, navigate **Settings > General Settings**
- Step 3** In the **Tenant Settings** area, disable the "**Enable the option to auto-accept device changes**" by sliding the toggle to the left so it shows a grey X. This disables Auto-Accept Changes option in the Conflict Detection menu and disables the feature for every device on your tenant.

Note Disabling "Auto-Accept" will require you to review each device conflict before you can accept it into CDO. This includes devices previously configured to auto-accept changes.

Resolve Configuration Conflicts

This section provides information about resolving configuration conflicts that occur on the device.

Resolve the Not Synced Status

Use the following procedure to resolve a device with a "Not Synced" Configuration Status:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Note** For an On-Prem Firewall Management Center, navigate **Tools & Services > Firewall Management Center** and select the FMC that is in **Not Synced** state and continue from Step 5.

- Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
- Step 3** Click the appropriate device type tab.
- Step 4** Select the device reported as Not Synced.
- Step 5** In the **Not synced** panel to the right, select either of the following:
- **Preview and Deploy...** -If you want to push the configuration change from CDO to the device, [Preview and Deploy Configuration Changes for All Devices](#) the changes you made now, or wait and deploy multiple changes at once.
 - **Discard Changes** -If you do **not** want to push the configuration change from CDO to the device, or you want to "undo" the configuration changes you started making on CDO. This option overwrites the configuration stored in CDO with the running configuration stored on the device.

Resolve the Conflict Detected Status

CDO allows you to enable or disable conflict detection on each live device. If [Conflict Detection, on page 124](#) is enabled and there was a change made to the device's configuration without using CDO, the device's configuration status will show **Conflict Detected**.

To resolve a "Conflict Detected" status, follow this procedure:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Note** For an On-Prem Firewall Management Center, navigate **Tools & Services > Firewall Management Center** and select the FMC that is in **Conflict Detected** state and continue from Step 4.
- Step 2** Click the **Devices** tab to locate your device.
- Step 3** Click the appropriate device type tab.
- Step 4** Select the device reporting the conflict and click **Review Conflict** in the details pane on the right.
- Step 5** In the **Device Sync** page, compare the two configurations by reviewing the highlighted differences.
- The panel labeled "Last Known Device Configuration" is the device configuration stored on CDO.
 - The panel labeled "Found on Device" is the configuration stored in the running configuration on the ASA.
- Step 6** Resolve the conflict by selecting one of the following:
- **Accept Device changes:** This will overwrite the configuration **and any pending changes stored on CDO** with the device's running configuration.
- Note** As CDO does not support deploying changes to the Cisco IOS devices outside of the command line interface, your only choice for a Cisco IOS device will be to select **Accept Without Review** when resolving the conflict.

- **Reject Device Changes:** This will overwrite the configuration stored on the device with the configuration stored on CDO.

Note All configuration changes, rejected or accepted, are recorded in the change log.

Schedule Polling for Device Changes

If you have [Conflict Detection, on page 124](#) enabled, or if you **Enable the option to auto-accept device changes** from the Settings page, CDO polls the device for the default interval to determine if a change has been made to the device's configuration outside of CDO. You can customize how often CDO polls for changes per device. These changes can be applied to more than one device.

If there is no selection configured for a device, the interval is automatically configured for "tenant default".



Note Customizing the interval per device from the **Inventory** page overrides the polling interval selected as the [Default Conflict Detection Interval](#) from the **General Settings** page.

After you enable **Conflict Detection** from the **Inventory** page or **Enable the option to auto-accept device changes** from the Settings page, use the following procedure to schedule how often you want CDO to poll your devices:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab to locate your device.
- Step 3** Click the appropriate device type tab.
- Step 4** Select the device or devices for which you want to enable conflict detection.
- Step 5** In the same area as **Conflict Detection**, click the drop-down menu for **Check every** and select the desired polling interval:

 **Conflict Detection** ● Enabled ▼

Check every: Tenant default (24 hours) ▼

Tenant default (24 hours)

10 minutes

1 hour

6 hours

24 hours



CHAPTER 4

Monitoring and Reporting Change Logs, Workflows, and Jobs

CDO effectively monitors configuration change logs, bulk device operations, and the process that runs when communicating with devices. This helps you understand how your network's existing policies influence its security posture.

- [Manage Change Logs in CDO, on page 131](#)
- [View Change Log Differences, on page 132](#)
- [Export the Change Log, on page 133](#)
- [Change Request Management, on page 134](#)
- [Monitor Jobs in CDO, on page 138](#)
- [Monitor Workflows in CDO, on page 140](#)

Manage Change Logs in CDO

The Change Log captures configuration changes made in CDO, providing a single view that includes changes in all supported devices and services. These are some of the features of the change log:

- Side-by-side comparison of changes made to device configuration.
- Plain-English labels for all change log entries.
- Records on-boarding and removal of devices.
- Detection of policy change conflicts occurring outside of CDO.
- Answers who, what, and when during an incident investigation or troubleshooting.
- The full change log, or only a portion, can be downloaded as a CSV file.

Manage Change Log Capacity

CDO retains the change log information for one year and deletes data older than a year.

There is a difference between the change log information stored in CDO's database and what you see in an exported change log. See [Export the Change Log, on page 133](#) for more information.

Change Log Entries

A change log entry reflects changes to a single device configuration, an action performed on a device, or if a change was made to the device outside of CDO.

- For change log entries that contain a change to configuration, you can expand the change by clicking anywhere in the row.
- For out-of-band changes made outside of CDO that are detected as a conflict, **System User** is reported as the Last User.
- CDO closes a change log entry after the device's configuration on CDO is synced with the configuration on the device or when a device is removed from CDO. Configurations are in sync after "reading" the configuration from the device to CDO or by deploying the configuration from CDO to the device.
- CDO creates a new change log entry immediately after closing an existing entry. Additional configuration changes are added to the open change log entry.
- Events are displayed for read, deploy, and delete actions against a device. These actions close a device's change log.
- A change log is closed once CDO is in sync with the configuration on the device (either by reading or deploying), or when CDO no longer manages the device.
- If a change is made to the device outside of CDO, a "conflict detected" entry is written to the change log.

Pending and Completed Change Log Entries

Change logs have a status of either **pending** or **completed**. As you make changes to a device's configuration using CDO, those changes are recorded in an **pending** change log entry. Reading a configuration from a device to CDO, deploying changes from CDO to a device, deleting a device from CDO completes, or running a CLI command that updates the running configuration file completes the pending change log and creates a new one for future changes.

Search and Filter Change Log Entries

You can search and filter change log entries. Use the search bar to find events that you search for. Use the filter  to find the entries that meet all the criteria you specify. You can also combine the operations by filtering the change log and adding a keyword to the search field to find an entry within the filtered results.

View Change Log Differences

Click **Diff** in the change log to open up a side-by-side comparison of the changes in the running configuration file of the device. You can see the differences in the two versions.

In the illustration below, the **Original Configuration** is the running configuration file before a change was written to the ASA, and the **Modified Configuration** column shows the running configuration file after the change was written. In this case, the **Original Configuration** column highlights a row in the running configuration file that actually didn't change but gives you a point of reference in the **Modified Configuration** column.

Follow the lines across from the left to the right column and you can see the addition of the HR_network object and the access rule preventing addresses in the "engineering" network to reach addresses in the "HR_network" network. Use the **Previous** and **Next** buttons to click through the changes in the file.

Related Topics

- [Manage Change Logs in CDO, on page 131](#)

Export the Change Log

You can export all or a subset of the CDO change log to a comma-separated value (.csv) file so you can filter and sort the information in it however you like.

To export the change log to a .csv file, follow this procedure:

Procedure

Step 1 In the navigation pane, click **Change Log**.

Step 2 Find the changes you want to export by taking one of these actions:

- Use the filter  field and the search field to find exactly what you want to export. For example, filter by device to see only the changes for your selected device or devices.
- Clear all the filters and search criteria in the change log. This allows you to export the entire change log.

Note CDO retains 1 year of change log data. It is recommended to filter the change log contents and download the results of a .csv file rather than downloading up to a year of change log history.

- Step 3** Click the export button  in the top right of the change log.
- Step 4** Give the .csv file a descriptive name and save the file to your local file system.

Differences Between the Change Log Capacity in CDO and the Size of an Exported Change Log

The information that you export from CDO's change log page is different from the change log information CDO stores in its database.

For every change log, CDO stores two copies of the device's configuration, the "starting" configuration and either the "ending" configuration in the case of a closed change log; or the "current" configuration, in the case of an open change log. This allows CDO to display configuration differences side by side. In addition, CDO tracks and stores every step "change event", with the username that made the change, the time the change was made, and other details.

When you export the change log, however, the export does not include the two complete copies of the configuration. It only includes the "change events," which makes the export file much smaller than the change log CDO stores.

CDO stores up to 1 year of change log information, this includes the two copies of the configuration.

Change Request Management

Change request management allows you to associate a change request and its business justification, opened in a third-party ticketing system, with an event in the Change Log. Use change request management to create a change request in CDO, identify it with a unique name, enter a description of the change, and associate the change request with change log events. You can later search the Change Log for the change request name.



Note You may also see references to Change Request Tracking in CDO. Change Request Tracking and Change Request Management refer to the same functionality.

Enable Change Request Management

Enabling change request tracking affects all users of your tenant. To enable Change Request Tracking, follow this procedure:

Procedure

- Step 1** From the user menu, select Settings.
- Step 2** From the user menu, click **General Settings**.
- Step 3** Click the slider under "Change Request Tracking".

Once confirmed, you see the Change Request toolbar appear in the lower left corner of the Defense Orchestrator interface and the Change Request drop-down menu in the Change Log.

Create a Change Request

Procedure

- Step 1** On any page within CDO, click the + on the change request toolbar at the lower-left side of the page.
- Step 2** Enter a change request name and description. The change request name must reflect a change request identifier your organization wants to implement. Use the description field to describe the purpose of change.
- Note** You can't change the name of a change request once you create it.
- Step 3** Save the change request.
- Note** CDO saves the change request and associates all new changes with that change request name until you disable change requests or clear the change request information in the change request toolbar.
-

Associate a Change Request with a Change Log Event

Procedure

- Step 1** In the navigation pane, click **Change Log**.
- Step 2** Expand the change log to show the events you want to associate with a change request.
- Step 3** In the Change Request column, click the drop-down menu for the event. Note that the newest change requests are listed at the top of the change request list.
- Step 4** Click the name of a change request and click **Select**.
-

Search for Change Log Events with Change Requests

Procedure

- Step 1** From the navigation pane, choose **Change Log**.
- Step 2** In the Change Log search field, enter the exact name of the change request to find the change log events associated with that change request. CDO highlights change log events with exact matches.
-

Search for a Change Request

Procedure

- Step 1** Click the change request menu in the change request toolbar.
 - Step 2** Start entering the name of the change request or a relevant keyword in the search field. As you type, you see results that partially match your input, appearing in both the name and description fields within the list of change requests.
-

Filter Change Requests

Procedure

- Step 1** From the navigation pane, choose **Change Log**.
 - Step 2** Click the filter icon to expand it, start typing the change request name in the search field. As you type, results that partially match your entry begin to appear.
 - Step 3** Select the change request and check the corresponding check box. The matches appear in the **Change Log** table. CDO highlights change log events with exact matches.
-

Clear the Change Request Toolbar

Clear the change request toolbar to prevent change log events from being automatically associated with an existing change request.

Procedure

- Step 1** Select the change request menu in the change request toolbar.
 - Step 2** Click **Clear**. The change request menu changes to **None**.
-

Clear a Change Request Associated with a Change Log Event

Procedure

- Step 1** From the navigation pane, choose **Change Log**.
- Step 2** Expand the change log to view the events that you want to disassociate from change requests.
- Step 3** Click the change request drop-down list for the event.

Step 4 Click **Clear**.

Delete a Change Request

When you delete a change request, you delete it from the change request list not from the change log.

Procedure

- Step 1** Click the change request menu in the change request toolbar.
 - Step 2** Click the bin icon to delete a change request.
 - Step 3** Click the check mark to confirm.
-

Disable Change Request Management

Disabling change request management affects all users of your account. To disable Change Request Management, follow this procedure:

Procedure

- Step 1** From the navigation pane, choose **Settings**.
 - Step 2** Disable the **Change Request Tracking** toggle button.
-

Change Request Management Use Cases

These use cases assume that you have previously enabled Change Request Management following the above instructions.

Track Firewall Changes Made to Resolve a Ticket Maintained in an External System

In this use case, you are making firewall changes to resolve a ticket maintained in an external system. You want to associate change log events resulting from those firewall changes with a change request. Follow this procedure to create a change request and associate change log events with it:

1. [Create a Change Request, on page 135](#).
2. Use the ticket name or number from the external system as the name of the change request. Add the justification for the change or other relevant information in the description field.
3. Ensure that the new change request is visible in the change request toolbar.
4. Make the firewall changes.
5. In the navigation pane, choose **Change Log** and find change log events that are associated with your new change request.

6. [Clear the Change Request Toolbar, on page 136](#) when done.

Manually Update Individual Change Log Events After Firewall Changes Are Made

In this use case, you made firewall changes to resolve a ticket that is maintained in an external system but forgot to use the change request management feature to associate change requests with the change log events. You want to update the change log events with the ticket number. Follow this procedure to associate change requests with change log events:

1. [Create a Change Request, on page 135](#). Use the ticket name or number from the external system as the name of the change request. Use the description field to add the justification for the change or other relevant information.
2. In the navigation pane, choose **Change Log** and search for the change log events that are associated with the firewall changes.
3. [Associate a Change Request with a Change Log Event, on page 135](#).
4. [Clear the Change Request Toolbar, on page 136](#) when done.

Search for Change Log Events Associated with a Change Request

In this use case, you want to find out what change log events were recorded in the Change Log because of the work that is done to resolve a ticket maintained in an external system. Follow this procedure to search for change log events that are associated with a change request:

1. In the navigation pane, choose **Change Log**.
2. Search for change log events that are associated with change requests using one of the methods below:
 - In the Change Log search field, enter the exact name of the change request to find change log events associated with that change request. CDO highlights change log events with exact matches.
 - [Filter Change Requests, on page 136](#) to find the change log events.
3. View each change log to find the highlighted change log events showing the associated change request.

Monitor Jobs in CDO

The **Jobs** page provides an overview of the progress of bulk operations, such as reconnecting multiple devices, reading configurations from multiple devices, or upgrading multiple devices simultaneously. The Jobs table uses color-coded rows with the status of individual actions, indicating if they have succeeded or failed.

One row in the table represents a single bulk operation. This one bulk operation may have been, for example, an attempt to reconnect 20 devices. Expanding a row in the **Jobs** page displays the results for each of the devices affected by the bulk operation.

Action	Status	User	Start	End	Scheduled
Execute CLI Command	0 1 0 0		11/2/2023, 9:37:03 AM	11/2/2023, 9:37:04 AM	
Deploy Changes	0 1 0 0		11/2/2023, 3:30:00 AM	11/2/2023, 3:30:04 AM	Every day at 3:30 AM
Deploy Changes	0 1 0 0		11/2/2023, 3:30:00 AM	11/2/2023, 3:30:03 AM	Every day at 3:30 AM
Deploy Changes	0 1 0 0		11/2/2023, 3:30:01 AM	11/2/2023, 3:30:03 AM	Every day at 3:30 AM
Deploy Changes	0 1 0 0		11/2/2023, 3:30:00 AM	11/2/2023, 3:30:02 AM	Every day at 3:30 AM
Deploy Changes	0 1 0 0		11/1/2023, 7:28:00 PM	11/1/2023, 7:34:26 PM	Every Wednesday at 7:28 PM
Toggle Conflict Detection	0 0 1 1		10/31/2023, 5:37:42 PM	10/31/2023, 5:37:43 PM	

You can reach the **Jobs** page two different ways:

- In the notifications tab when there is new Jobs notification, click the **Review** link. You will be redirected to the **Jobs** page and see the specific job represented by the notification.

The notifications tab displays status information about the job. This example shows the bulk action (Reconnect), the number of actions in the job (20), actions being processed (13), number of actions failed (1), number of warnings (0), and number of actions succeeded (6).

- From CDO's menu, select **Jobs**. This table shows a complete list of the bulk actions performed in CDO.

Search Jobs in CDO

When you're on the **Jobs** page, you can filter and search by different actions, the users who performed them, and the action status.

Reinitiate a Bulk Action

After reviewing the **Jobs** page, if one or more actions in a bulk action fail, you can retry the bulk action after making necessary corrections. CDO will re-run the job only for the failed actions. To re-run a bulk action:

Procedure

- Step 1** Select the row in the jobs page that indicates a failed action.
- Step 2** Click **Retry**.

Cancel a Bulk Action

You now have the ability to cancel any bulk actions that are currently in progress on multiple devices. For example, if you have tried to reconnect four managed devices and three of them have successfully reconnected, but the fourth device is still neither connected nor disconnected, you can cancel the bulk action.

To cancel a bulk action:

Procedure

- Step 1** On the CDO navigation menu, click **Jobs**.
- Step 2** Identify the running bulk action and click the **Cancel** link on the right side.

If any part of the bulk action is successful, it cannot be undone. Any ongoing action will be cancelled.

Monitor Workflows in CDO

The Workflow page allows you to monitor every process that CDO runs when communicating with devices, Secure Device Connector (SDC), or Secure Event Connector (SEC), and when applying ruleset changes to devices. CDO creates an entry in the workflow table for every step and displays its outcome on this page. The entry contains information pertaining only to the action performed by CDO and not the device it is interacting with.

CDO reports an error when it fails to perform a task on a device, and you can navigate to the Workflows page to see the step where the error occurred for more details.

You can visit this page to determine and troubleshoot errors or share information with TAC when they insist.

To navigate to the Workflows page, on the **Inventory** page, click the **Devices** tab. Click the appropriate device type tab to locate the device and select the device you want. In the **Devices and Actions** in the right pane, click **Workflows**. The following picture shows the Workflow page with entries in the Workflow table.

Name	Priority	Condition	Current State	Last Active	Time
ftdObjDetectionStateMachine	Scheduled	Done	Done	12/4/2020, 2:17:16 PM	14:17:00.381 / 14:17:16.640
ftdVpnSessionDetailsStateMachine	Scheduled	Done	Done	12/4/2020, 2:04:02 PM	14:04:00.278 / 14:04:02.481
ftdVpnSessionDetailsStateMachine	Scheduled	Done	Done	12/4/2020, 1:04:02 PM	13:04:00.433 / 13:04:02.747
ftdVpnSessionDetailsStateMachine	Scheduled	Done	Done	12/4/2020, 12:04:02 PM	12:04:00.307 / 12:04:02.507
ftdVpnSessionDetailsStateMachine	Scheduled	Done	Done	12/4/2020, 11:04:02 AM	11:04:00.205 / 11:04:02.290
ftdVpnSessionDetailsStateMachine	Scheduled	Done	Done	12/4/2020, 10:04:02 AM	10:04:00.312 / 10:04:02.541
ftdVpnSessionDetailsStateMachine	Scheduled	Error	Error	12/2/2020, 1:10:25 PM	13:04:00.291 / 13:10:25.140

ACTION	TIME	START STATE	END STATE	RESULT
ftdInitiateVpnSessionChecksAction	13:04:00.310 / 13:04:00.317	PENDING_GET_VPN_SESSION_DETAILS	@ INITIATE_GET_VPN_SESSION_DETAILS	SUCCESS
ftdInitiateGetBaseObjectsAction	13:04:00.335 / 13:04:00.372	INITIATE_GET_VPN_SESSION_DETAILS	@ WAIT_FOR_GET_VPN_SESSION_DETAILS	SUCCESS
ftdInitiateGetVpnSessionDetailsResponseHandler	13:10:25.116 / 13:10:25.132	AWAIT_RESPONSE_FROM_executeFullRequests	ERROR	FAILURE Error Message / Stack Trace

HOOK	TYPE	TIME	RESULT
DeviceStateMachineClearErrorBeforeHook	Before	13:04:00.292 / 13:04:00.302	clearErrors
AddDeviceNameToStateMachineDebugAfterHook	After	13:10:25.142 / 13:10:25.143	No debug record
DeviceStateMachineSetErrorAfterHook	After	13:10:25.143 / 13:10:25.157	setErrorOnDevice

Export Device Workflows

You can download the complete workflow information to a JSON file and provide it when the TAC team asks for further analysis. To export this information, you can select the device and navigate to its Workflows page and click the export button  appearing on the top right corner.

Copy Stack Trace

If you have an error you cannot resolve, TAC may ask you for a copy of the stack trace. To collect the stack trace for the error, click the **Stack Trace** link and click **Copy Stacktrace** to copy the stacks appearing on the screen to a clipboard.



CHAPTER 5

Terraform

- [About Terraform, on page 143](#)

About Terraform

CDO customers can use the [CDO Terraform provider](#) and CDO Terraform modules to rapidly set up their tenants using code that is repeatable and version-controlled. The CDO Terraform provider allows users to do the following:

- **Manage** users
- **Onboard** Secure Firewall Threat Defense devices on cloud-delivered Firewall Management Centers, Cisco Secure ASA devices, and iOS devices
- **Onboard** secure device connectors on vSphere and AWS
- **Onboard** secure event connectors on AWS

For more information, refer to the following pages:

- [CDO Terraform Provider page](#)
- [CDO SDC on vSphere module page](#)
- [CDO SDC on AWS module page](#)
- [CDO SEC on AWS module page](#)
- Work through the [Devnet learning lab](#)
- [Automating Security Infrastructure Management Using the Cisco Defense Orchestrator Terraform Provider - Learning Lab](#)
- [CDO automation examples](#) on GitHub

Support

The CDO Terraform provider and modules are published as Open Source Software under the Apache 2.0 license. Please file issues on GitHub in the repositories below if you require support:

Module	Repository
CDO Terraform Provider	https://github.com/cisco/devnet/terraform-provider-cdo
CDO SDC Module (vSphere)	https://github.com/CiscoDevNet/terraform-vsphere-cdo-sdc
CDO SDC Module (AWS)	https://github.com/CiscoDevNet/terraform-aws-cdo-sdc
CDO SEC Module (AWS)	https://github.com/CiscoDevNet/terraform-aws-cdo-sec

Contribution to Repositories

The CDO team welcomes contributions to the repositories above. Please create pull requests on these GitHub repositories if you wish to contribute to improving the provider and modules.

Related Topics

- [Deploy an SDC to vSphere Using Terraform](#)
- [Deploy an SDC to AWS VPC Using Terraform](#)
- [Deploy an SEC to AWS VPC Using Terraform](#)



CHAPTER 6

Troubleshooting

This chapter covers the following sections:

- [Troubleshoot a Secure Device Connector, on page 145](#)
- [Troubleshoot Cisco Defense Orchestrator, on page 153](#)
- [Device Connectivity States, on page 161](#)

Troubleshoot a Secure Device Connector

Use these topics to troubleshoot an on-premises Secure Device Connector (SDC).

If none of these scenarios match yours, [How CDO Customers Open a Support Ticket with TAC](#).

SDC is Unreachable

An SDC is in the state "Unreachable" if it has failed to respond to two heartbeat requests from CDO in a row. If your SDC is unreachable, your tenant will not be able to communicate with any of the devices you have onboarded.

CDO indicates that an SDC is unreachable in these ways:

- You see the message, "Some Secure Device Connectors (SDC) are unreachable. You will not be able to communicate with devices associated with these SDCs." on the CDO home page.
- The SDC's status in the Services page is "Unreachable."

First, attempt to reconnect the SDC to your tenant to resolve this issue:

1. Check that the SDC virtual machine is running and can reach a CDO IP address in your region. See [Connect Cisco Defense Orchestrator to your Managed Devices, on page 9](#).
2. Attempt to reconnect CDO and the SDC by requesting a heartbeat manually. If the SDC responds to a heartbeat request, it will return to "Active" status. To request a heartbeat manually:
 - a. From the CDO menu, choose **Tools & Services > Secure Connectors**.
 - b. Click the SDC that is unreachable.
 - c. In the Actions pane, click **Request Heartbeat**.
 - d. Click **Reconnect**.

3. If the SDC does not return to the Active status after manually attempting to reconnect it to your tenant, follow the instructions in [SDC Status Does not Become Active on CDO after Deployment](#), on page 146.

SDC Status Does not Become Active on CDO after Deployment

If CDO does not indicate that your SDC is active in about 10 minutes after deployment, connect to the SDC VM using SSH using the `cdo` user and password you created when you deployed the SDC.

Procedure

-
- Step 1** Review `/opt/cdo/configure.log`. It shows you the configuration settings you entered for the SDC and if they were applied successfully. If there were any failures in the setup process or if the values weren't entered correctly, run the `sdc-onboard setup` again:
- a) At the `[cdo@localhost cdo]$` prompt enter `sudo sdc-onboard setup`.
 - b) Enter the password for the `cdo` user.
 - c) Follow the prompts. The setup script guides you through all the configuration steps you took in the setup wizard and gives you an opportunity to make changes to the values you entered.
- Step 2** If after reviewing the log and running `sudo sdc-onboard setup`, CDO still does not indicate that the SDC is Active, [Contact Cisco Defense Orchestrator Support](#).
-

Changed IP Address of the SDC is not Reflected in CDO

If you changed the IP address of the SDC, it will not be reflected in CDO until after 3:00 AM GMT.

Troubleshoot Device Connectivity with the SDC

Use this tool to test connectivity from CDO, through the Secure Device Connector (SDC) to your device. You may want to test this connectivity if your device fails to onboard or if you want to determine, before on-boarding, if CDO can reach your device.

Procedure

-
- Step 1** From the CDO menu, choose **Tools & Services > Secure Connectors**.
- Step 2** Select the SDC.
- Step 3** In the **Troubleshooting** pane on the right, click **Device Connectivity**.
- Step 4** Enter a valid IP address or FQDN and port number of the device you are attempting to troubleshoot, or attempting to connect to, and click **Go**. CDO performs the following verifications:
- a) **DNS Resolution** - If you provide a FQDN instead of an IP address, this verifies the SDC can resolve the domain name and acquires the IP address.
 - b) **Connection Test** - Verifies the device is reachable.
 - c) **TLS Support** - Detects the TLS versions and ciphers that both the device and the SDC support.

- **Unsupported Cipher** - If there are no TLS version that are supported by both the device and the SDC, CDO also tests for TLS versions and ciphers that are supported by the device, but not the SDC.

d) SSL Certificate - The troubleshoot provides certificate information.

Step 5 If you continue to have issues onboarding or connecting to the device, [Contact Cisco Defense Orchestrator Support](#).

Intermittent or No Connectivity with SDC

The solution discussed in this section applies only to an on-premise Secure Device Connector (SDC).

Symptom: Intermittent or no connectivity with SDC.

Diagnosis: This problem may occur if the disk space is almost full (above 80%).

Perform the following steps to check the disk space usage.

1. Open the console for your Secure Device Connector (SDC) VM.
2. Log in with the username **cdo**.
3. Enter the password created during the initial login.
4. First, check the amount of free disk space by typing **df -h** to confirm that there is no free disk space available.

You can confirm that the disk space was consumed by the Docker. The normal disk usage is expected to be under 2 Gigabytes.

5. To see the disk usage of the **Docker** folder, execute **sudo du -h /var/lib/docker | sort -h**.

You can see the disk space usage of the **Docker** folder.

Procedure

If the disk space usage of the Docker folder is almost full, define the following in the docker config file:

- Max-size: To force a log rotation once the current file reaches the maximum size.
- Max-file: To delete excess rotated log files when the maximum limit it reached.

Perform the following:

1. Execute **sudo vi /etc/docker/daemon.json**.
2. Insert the following lines to the file.

```
{  
  "log-driver": "json-file",  
  "log-opts": {"max-size": "100m", "max-file": "5" }  
}
```

- Press **ESC** and then type **:wq!** to write the changes and close the file.



Note You can execute `sudo cat /etc/docker/daemon.json` to verify the changes made to the file.

- Execute `sudo systemctl restart docker` to restart the docker file.
It will take a few minutes for the changes to take effect. You can execute `sudo du -h /var/lib/docker | sort -h` to see the updated disk usage of the docker folder.
- Execute `df -h` to verify that the free disk size has increased.
- Before your SDC status can change from Unreachable to Active, you must go to the Secure Connectors tab in the **Services** page from CDO and click **Request Reconnect** from the Actions menu.

Container Privilege Escalation Vulnerability Affecting Secure Device Connector: cisco-sa-20190215-runc

The Cisco Product Security Incident Response Team (PSIRT) published the security advisory [cisco-sa-20190215-runc](#) which describes a high-severity vulnerability in Docker. [Read the entire PSIRT team advisory](#) for a full explanation of the vulnerability.

This vulnerability impacts all CDO customers:

- Customers using CDO's cloud-deployed Secure Device Connector (SDC) do not need to do anything as the remediation steps have already been performed by the CDO Operations Team.
- Customers using an SDC deployed on-premise need to upgrade their SDC host to use the latest Docker version. They can do so by using the following instructions:
 - [Updating a CDO-Standard SDC Host, on page 148](#)
 - [Updating a Custom SDC Host, on page 149](#)
 - [Bug Tracking, on page 149](#)

Updating a CDO-Standard SDC Host

Use these instructions if you [Deploy a Secure Device Connector Using CDO's VM Image](#)

Procedure

- Step 1** Connect to your SDC host using SSH or the hypervisor console.
- Step 2** Check the version of your Docker service by running this command:

```
docker version
```
- Step 3** If you are running one of the latest virtual machines (VMs) you should see output like this:

```
> docker version
Client:
Version: 18.06.1-ce
```

```
API version: 1.38
Go version: go1.10.3
Git commit: e68fc7a
Built: Tue Aug 21 17:23:03 2018
OS/Arch: linux/amd64
Experimental: false
```

It's possible you may see an older version here.

Step 4 Run the following commands to update Docker and restart the service:

```
> sudo yum update docker-ce
> sudo service docker restart
```

Note There will be a brief connectivity outage between CDO and your devices while the docker service restarts.

Step 5 Run the docker version command again. You should see this output:

```
> docker version
Client:
 Version: 18.09.2
 API version: 1.39
 Go version: go1.10.6
 Git commit: 6247962
 Built: Sun Feb XX 04:13:27 2019
 OS/Arch: linux/amd64
 Experimental: false
```

Step 6 You are done. You have now upgraded to the latest, and patched, version of Docker.

Updating a Custom SDC Host

If you have created your own SDC host you will need to follow the instructions to update based on how you installed Docker. If you used CentOS, yum and Docker-ce (the community edition) the preceding procedure will work.

If you have installed Docker-ee (the enterprise edition) or used an alternate method to install Docker, the fixed versions of Docker may be different. You can check the Docker page to determine the correct versions to install: [Docker Security Update and Container Security Best Practices](#).

Bug Tracking

Cisco is continuing to evaluate this vulnerability and will update the advisory as additional information becomes available. After the advisory is marked Final, you can refer to the associated Cisco bug for further details:

[CSCvo33929-CVE-2019-5736: runc container breakout](#)

Invalid System Time

Cisco Defense Orchestrator (CDO) is adapting a new way of communicating with the Secure Device Connector (SDC). To facilitate this, CDO must migrate your existing SDC to the new communication method by February 1, 2024.



Note If your SDC is not migrated by February 1, 2024, CDO will no longer be able to communicate with your devices through the SDC.

CDO's operations team attempted to migrate your SDC but was unsuccessful because your SDC system time was 15 minutes ahead or behind the AWS system time.

Please follow the steps below to correct the system time issue. Once this problem is resolved, we will be able to proceed with the migration.

Procedure

- Step 1** Login to your SDC VM through the VM terminal or by making an SSH connection.
- Step 2** At the prompt, enter `sudo sdc-onboard setup` and authenticate.
- Step 3** You are now going to respond to the SDC setup questions as if you were setting up the SDC for the first time. Re-enter all the same passwords and network information as you had before, except take special note of the NTP server address:
- a) Reset the root and cdo user passwords with the same passwords you used to setup the SDC.
 - b) When prompted, enter `y` to re-configure the network.
 - c) Enter the value for IP address/CIDR as you had before.
 - d) Enter the value for the network gateway as you had before.
 - e) Enter the value for the DNS Server as you had before.
 - f) When prompted for the NTP server, be sure to provide a valid NTP server address, such as `time.aws.com`.
 - g) Review the values you provided and enter `y` if they are correct.
- Step 4** Validate that your time server is reachable and synchronized with your SDC by entering `date` at the prompt. The UTC date and time are displayed and you can compare it to your SDC time.
-

What to do next

[Contact the Cisco Technical Assistance Center \(TAC\)](#) once you have completed these steps, or in case you encounter any errors. Once you have successfully completed these steps, the CDO operations team can complete your SDC migration to the new communication method.

SDC version is lower than 202311****

Cisco Defense Orchestrator (CDO) is adapting a new way of communicating with the Secure Device Connector (SDC). To facilitate this, CDO must migrate your existing SDC to the new communication method by February 1, 2024.



Note If your SDC is not migrated by February 1, 2024, CDO will no longer be able to communicate with your devices through the SDC.

CDO's operations team attempted to migrate your SDC but was unsuccessful because your tenant is running a version lower than 202311****.

The current version of your SDC is listed on the Secure Connectors page by navigating from the CDO menu bar, **Tools & Services > Secure Connectors**. After selecting your SDC, its version number is found in the **Details** pane on the right of the screen.

Please follow the steps below to upgrade the SDC version. Once this problem is resolved, CDO operations will be able to run the migration process again.

Procedure

- Step 1** Log in to the SDC VM and authenticate.
- Step 2** At the prompt, enter `sudo su - sdc` and authenticate.
- Step 3** At the prompt, enter `crontab -r`.
- If you receive the message `no crontab for sdc` you can ignore it and move to the next step.
- Step 4** At the prompt, enter `./toolkit/toolkit.sh upgrade`. CDO will determine if you need an upgrade and upgrade the toolkit. Ensure that no errors were reported in the console.
- Step 5** Verify the new version of the SDC:
- Log in to CDO.
 - Navigate to the Secure Connectors page by navigating from the CDO menu bar, **Tools & Services > Secure Connectors**.
 - Select your SDC and click **Request Heartbeat** in the **Actions** pane.
 - Validate that the SDC version is 202311**** or later.
-

What to do next

[Contact the Cisco Technical Assistance Center \(TAC\)](#) once you have completed these steps, or in case you encounter any errors. Once you have successfully completed these steps, the CDO operations team can run the migration process again.

Certificate or Connection errors with AWS servers

Cisco Defense Orchestrator (CDO) is adapting a new way of communicating with the Secure Device Connector (SDC). To facilitate this, CDO must migrate your existing SDC to the new communication method by February 1, 2024.



Note If your SDC is not migrated by February 1, 2024, CDO will no longer be able to communicate with your devices through the SDC.

CDO's operations team attempted to migrate your SDC but was unsuccessful because they experienced a connection issue.

Please follow the steps below to correct the connection issue. Once this problem is resolved, we will be able to proceed with the migration.

Procedure

Step 1 Create firewall rules that allow outbound proxy connections, on port 443, to the domains in your region:

- Production tenants in the US region:
 - cognito-identity.us-west-2.amazonaws.com
 - cognito-idp.us-west-2.amazonaws.com
 - sns.us-west-2.amazonaws.com
 - sqs.us-west-2.amazonaws.com
- Production tenants in the EU region:
 - cognito-identity.eu-central-1.amazonaws.com
 - cognito-idp.eu-central-1.amazonaws.com
 - sns.eu-central-1.amazonaws.com
 - sqs.eu-central-1.amazonaws.com
- Production tenants in the APJ region:
 - cognito-identity.ap-northeast-1.amazonaws.com
 - cognito-idp.ap-northeast-1.amazonaws.com
 - sqs.ap-northeast-1.amazonaws.com
 - sns.ap-northeast-1.amazonaws.com

Step 2 You can determine the full list of IP addresses you need to add to your firewall's "allow list" by using one of the commands below.

Note The commands below are for users that have **jq** installed. The IP addresses will be displayed in a single list.

- Production tenants in the US region:

```
curl -s https://ip-ranges.amazonaws.com/ip-ranges.json | jq -r '.prefixes[] | select(
  (.service == "AMAZON" ) and .region == "us-west-2") | .ip_prefix'
```

- Production tenants in the EU region:

```
curl -s https://ip-ranges.amazonaws.com/ip-ranges.json | jq -r '.prefixes[] | select(
  (.service == "AMAZON" ) and .region == "eu-central-1") | .ip_prefix'
```

- Production tenants in the APJ region:

```
curl -s https://ip-ranges.amazonaws.com/ip-ranges.json | jq -r '.prefixes[] | select(
  (.service == "AMAZON" ) and .region == "ap-northeast-1") | .ip_prefix'
```

Note If you don't have `jq` installed, you can use this shortened version of the command:

```
curl -s https://ip-ranges.amazonaws.com/ip-ranges.json
```

What to do next

Contact the [Cisco Technical Assistance Center \(TAC\)](#) once you have completed these steps, or in case you encounter any errors. Once you have successfully completed these steps, the CDO operations team can complete your SDC migration to the new communication method.

Troubleshoot Cisco Defense Orchestrator

Troubleshooting Login Failures

Login Fails Because You are Inadvertently Logging in to the Wrong CDO Region

Make sure you are logging into the appropriate CDO region. After you log into <https://sign-on.security.cisco.com>, you will be given a choice of what region to access. Click the **CDO** tile to access `defenseorchestrator.com` or **CDO (EU)** to access `defenseorchestrator.eu`.

Troubleshooting Login Failures after Migration

Login to CDO Fails Because of Incorrect Username or Password

Solution If you try to log in to CDO and you *know* you are using the correct username and password and your login is failing, or you try "forgot password" cannot recover a viable password, you may have tried to login without creating a new Cisco Security Cloud Sign On account, you need to sign up for a new Cisco Security Cloud Sign On Account by following the instructions in [Create a New Cisco Security Cloud Sign On Account and Configure Duo Multi-factor Authentication, on page 62](#).

Login to the Cisco Security Cloud Sign On Dashboard Succeeds but You Can't Launch CDO

Solution You may have created a Cisco Security Cloud Sign On account with a different username than your CDO tenant. Contact the [Cisco Technical Assistance Center \(TAC\)](#) to standardize your user information between CDO and Cisco Secure Sign-On.

Login Fails Using a Saved Bookmark

Solution You may be attempting to log in using an old bookmark you saved in your browser. The bookmark could be pointing to <https://cdo.onelogin.com>.

Solution Log in to <https://sign-on.security.cisco.com>.

- **Solution** If you have not yet created a a Cisco Secure Sign-On account, [Create a New Cisco Security Cloud Sign On Account and Configure Duo Multi-factor Authentication](#).
- **Solution** If you have created your new account, click the CDO tile on the dashboard that corresponds to Cisco Defense Orchestrator(US), Cisco Defense Orchestrator (EU), or Cisco Defense Orchestrator (APJC)
- **Solution** Update your bookmark to point to <https://sign-on.security.cisco.com>.

Troubleshooting Access and Certificates

Resolve New Fingerprint Detected State

Procedure

- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Select the device in the **New Fingerprint Detected** state.
 - Step 5** Click **Review Fingerprint** in the New Fingerprint Detected pane.
 - Step 6** When prompted to review and accept the fingerprint:
 - a. Click **Download Fingerprint** and review it.
 - b. If you are satisfied with the fingerprint, click **Accept**. If you are not, click **Cancel**.
 - Step 7** After you resolve the new fingerprint issue, the connectivity state of the device may show **Online** and the Configuration Status may show "Not Synced" or "Conflict Detected." Review [Resolve Configuration Conflicts](#) to review and resolve configuration differences between CDO and the device.
-

Troubleshooting Network Problems Using Security and Analytics Logging Events

Here is a basic framework you can use to troubleshoot network problems using the Events Viewer.

This scenario assumes that your network operations team has had a report that a user can't access a resource on the network. Based on the user reporting the issue and their location, the network operations team has a reasonable idea of which firewall controls their access to resources.



Note This scenario also assumes that an FDM-managed device is the firewall managing the network traffic. Security Analytics and Logging does not collect logging information from other device types.

Procedure

- Step 1** In the navigation pane, choose **Analytics > Event Logging**.
- Step 2** Click the **Historical** tab.
- Step 3** Start filtering events by **Time Range**. By default, the Historical tab shows the last hour of events. If that is the correct time range, enter the current date and time as the **End** time. If that is not the correct time range, enter a start and end time encompassing the time of the reported issue.
- Step 4** Enter the IP address of the firewall that you suspect is controlling the user's access in the **Sensor ID** field. If it could be more than one firewall, filter events using **attribute:value** pairs in the search bar. Make two entries and combine them with an OR statement. For example: `SensorID:192.168.10.2 OR SensorID:192.168.20.2`.
- Step 5** Enter the user's IP address in the **Source IP** field in the Events filter bar.

- Step 6** If the user can't access a resource, try entering that resource's IP address in the **Destination IP** field.
- Step 7** Expand the events in the results and look at their details. Here are some details to look at:
- **AC_RuleAction** - The action taken (Allow, Trust, Block) when the rule was triggered.
 - **FirewallPolicy** - The policy in which the rule that triggered the event resides.
 - **FirewallRule** - The name of the rule that triggered the event. If the value is Default Action then it was the default action of the policy that triggered the event and not one of the rules in the policy.
 - **UserName** - The user associated with the initiator IP address. The Initiator IP address is the same as the Source IP address.
- Step 8** If the rule action is preventing access, look at the FirewallRule and FirewallPolicy fields to identify the rule in the policy that is blocking access.
-

Troubleshooting SSL Decryption Issues

Handling Web Sites Where Decrypt Re-sign Works for a Browser but not an App (SSL or Certificate Authority Pinning)

Some apps for smart phones and other devices use a technique called SSL (or Certificate Authority) pinning. The SSL pinning technique embeds the hash of the original server certificate inside the app itself. As a result, when the app receives the resigned certificate from the Firepower Threat Defense device, the hash validation fails and the connection is aborted.

The primary symptom is that users cannot connect to the web site using the site's app, but they can connect using the web browser, even when using the browser on the same device where the app fails. For example, users cannot use the Facebook iOS or Android app, but they can point Safari or Chrome at <https://www.facebook.com> and make a successful connection.

Because SSL pinning is specifically used to avoid man-in-the-middle attacks, there is no workaround. You must choose between the following options:

More Details

If a site works in a browser but not in an app on the same device, you are almost certainly looking at an instance of SSL pinning. However, if you want to delve deeper, you can use connection events to identify SSL pinning in addition to the browser test.

There are two ways an app might deal with hash validation failures:

- Group 1 apps, such as Facebook, send an SSL ALERT Message as soon as it receives the SH, CERT, SHD message from the server. The Alert is usually an "Unknown CA (48)" alert indicating SSL Pinning. A TCP Reset is sent following the Alert message. You should see the following symptoms in the event details:
 - SSL Flow Flags include ALERT_SEEN.
 - SSL Flow Flags do not include APP_DATA_C2S or APP_DATA_S2C.
 - SSL Flow Messages typically are: CLIENT_HELLO, SERVER_HELLO, SERVER_CERTIFICATE, SERVER_KEY_EXCHANGE, SERVER_HELLO_DONE.

- Group 2 apps, such as Dropbox, do not send any alerts. Instead they wait until the handshake is done and then send a TCP Reset. You should see the following symptoms in the event:
 - SSL Flow Flags do not include ALERT_SEEN, APP_DATA_C2S, or APP_DATA_S2C.
 - SSL Flow Messages typically are: CLIENT_HELLO, SERVER_HELLO, SERVER_CERTIFICATE, SERVER_KEY_EXCHANGE, SERVER_HELLO_DONE, CLIENT_KEY_EXCHANGE, CLIENT_CHANGE_CIPHER_SPEC, CLIENT_FINISHED, SERVER_CHANGE_CIPHER_SPEC, SERVER_FINISHED.

Troubleshooting Login Failures after Migration

Login to CDO Fails Because of Incorrect Username or Password

Solution If you try to log in to CDO and you *know* you are using the correct username and password and your login is failing, or you try "forgot password" cannot recover a viable password, you may have tried to login without creating a new Cisco Security Cloud Sign On account, you need to sign up for a new Cisco Security Cloud Sign On Account by following the instructions in [Create a New Cisco Security Cloud Sign On Account and Configure Duo Multi-factor Authentication, on page 62](#).

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- **Solution** Update your bookmark to point to <https://sign-on.security.cisco.com>.

Troubleshooting Objects

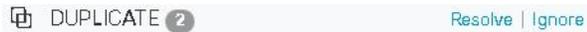
Resolve Duplicate Object Issues

Duplicate objects  are two or more objects on the same device with different names but the same values. These objects are usually created accidentally, serve similar purposes, and are used by different policies. After resolving duplicate object issues, CDO updates all affected object references with the retained object name.

To resolve duplicate object issues:

Procedure

- Step 1** In the CDO navigation bar on the left, click **Objects** and choose an option.
- Step 2** Then [Object Filters](#) the objects to find duplicate object issues.
- Step 3** Select one of the results. In the objects details panel, you will see the DUPLICATE field with the number of duplicates affected:

A screenshot of a user interface element. It shows a label 'DUPLICATE' followed by a small circle containing the number '2'. To the right of this label are two buttons: 'Resolve' and 'Ignore', both in a light blue color.

- Step 4** Click **Resolve**. CDO displays the duplicate objects for you to compare.
- Step 5** Select two of the objects to compare.
- Step 6** You now have these options:
- If you want to replace one of the objects with the other, click **Pick** for the object you to keep, click **Resolve** to see what devices and network policies will be affected, and then click **Confirm** if you are satisfied with the changes. CDO keeps the object you selected as the replacement and deletes the duplicate.
 - If you have an object in the list that you want to ignore, click **Ignore**. If you ignore an object, it will be removed from the list of duplicate objects that CDO shows you.
 - Click **Ignore All** if you want to keep the object but do not want CDO to find it in a search for duplicate objects.
- Step 7** Once the duplicate object issue has been resolved [Preview and Deploy Configuration Changes for All Devices](#) the changes you made now, or wait and deploy multiple changes at once.
-

Resolve Unused Object Issues

Unused objects  are objects that exist in a device configuration but are not referenced by another object, an access-list, or a NAT rule.

Related Information:

- [Export a List of Devices and Services, on page 77](#)
- [Bulk Reconnect Devices to CDO, on page 81](#)

Resolve an Unused Object Issue

Procedure

- Step 1** In the CDO navigation bar on the left, click **Objects** and choose an option.
- Step 2** Then [Object Filters](#) the objects to find unused object issues.
- Step 3** Select one or more unused objects.
- Step 4** You now have these options:
- In the Actions pane, click **Remove**  to remove the unused object from CDO.

- In the Issues pane, click **Ignore**. If you ignore an object, CDO will stop displaying it among the results of unused objects objects.

Step 5 If you removed the unused object, [Preview and Deploy Configuration Changes for All Devices](#), on page 118 the changes you made now, or wait and deploy multiple changes at once.

Note To resolve unused object issues in bulk, see [Resolve Object Issues in Bulk](#).

Remove Unused Objects in Bulk

Procedure

Step 1 In the CDO navigation bar on the left, click **Objects** and choose an option.

Step 2 Then [Object Filters](#) the objects to find unused object issues.

Step 3 Select the unused objects you want to delete:

- Click the checkbox in the object table header row to select all the objects on the page.
- Select individual unused objects in the object table.

Step 4 In the Actions pane on the right, click **Remove**  to remove all the unused objects you selected in CDO. You can remove 99 objects at a time.

Step 5 Click **OK** to confirm you want to delete the unused objects.

Step 6 You have two choices to deploy these changes:

- [Preview and Deploy Configuration Changes for All Devices](#) the changes you made now, or wait and deploy multiple changes at once.
- Open the **Inventory** page and find the devices that were affected by the change. Select all the devices affected by the change and, in the Management pane, click **Deploy All** . Read the warning and take the appropriate action.

Resolve Inconsistent Object Issues

Inconsistent objects  INCONSISTENT  [Resolve](#) | [Ignore](#) are objects with the same name, but different values, on two or more devices. Sometimes users create objects in different configurations with the same name and content, but over time the values of these objects diverge, which creates the inconsistency.

Note: To resolve inconsistent object issues in bulk, see [Resolve Object Issues in Bulk](#).

You can perform the following on inconsistent objects:

- **Ignore:** CDO ignores the inconsistency between objects and retains their values. The objects will no longer be listed under the inconsistency category.
- **Merge:** CDO combines all selected objects and their values into a single object group.
- **Rename:** CDO allows you to rename one of the inconsistent objects and give it a new name.

- **Convert Shared Network Objects to Overrides:** CDO allows you to combine inconsistent shared objects (with or without overrides) into a single shared object with overrides. The most common default value from the inconsistent objects is set as a default in the newly formed object.



Note If there are multiple common default values, one of them is selected as the default. The remaining default values and override values are set as overrides of that object.

- **Convert Shared Network Group to Additional Values:** - CDO allows you to combine inconsistent shared network groups into a single shared network group with additional values. The criteria for this functionality is that the inconsistent network groups to be converted must have a minimum of one common object with the same value. All default values that match this criterion becomes the default values, and the remaining objects are assigned as additional values of the newly formed network group.

For example, consider two inconsistent shared network groups. The first network group 'shared_network_group' is formed with 'object_1' (192.0.2.x) and 'object_2' (192.0.2.y). It also contains additional value 'object_3' (192.0.2.a). The second network group 'shared_network_group' is formed with 'object_1' (192.0.2.x) and additional value 'object_4' (192.0.2.b). On converting the shared network group to additional values, the newly formed group 'shared_network_group' contain 'object_1' (192.0.2.x) and 'object_2' (192.0.2.y) as default values and 'object_3' (192.0.2.a) and 'object_4' (192.0.2.b) as additional values.



Note When you create a new network object, CDO auto assigns its value as an override to an existing shared network object with the same name. This is also applicable when a new device is onboarded to CDO.

The auto-assignment happens only when the following criteria are met:

1. The new network object must be assigned to a device.
2. Only one shared object with the same name and type must be existing in the tenant.
3. The shared object must already contain overrides.

To resolve inconsistent object issues:

Procedure

-
- Step 1** In the CDO navigation bar on the left, click **Objects** and choose an option.
 - Step 2** Then **Object Filters** the objects to find inconsistent object issues.
 - Step 3** Select an inconsistent object. In the objects details panel, you will see the INCONSISTENT field with the number of objects affected:



- Step 4** Click **Resolve**. CDO displays inconsistent objects for you to compare.
- Step 5** You now have these options:

- **Ignore All:**
 - a. Compare the objects presented to you and on one of the objects, click **Ignore**. Or, to ignore all objects, click **Ignore All**.
 - b. Click **OK** to confirm.
- **Resolve by merging objects:**
 - a. Click **Resolve by Merging X Objects**.
 - b. Click **Confirm**.
- **Rename:**
 - a. Click **Rename**.
 - b. Save your changes to affected network policies and devices and click **Confirm**.
- **Convert to Overrides (for inconsistent shared objects):** When comparing shared objects with overrides, the comparison panel shows only the default values in the **Inconsistent Values** field.
 - a. Click **Convert to Overrides**. All inconsistent objects will be converted to a single shared object with overrides.
 - b. Click **Confirm**. You can click **Edit Shared Object** to view the details of the newly formed object. You can use up and down arrows to move the values between default and override.
- **Convert to Additional Values (for inconsistent network groups):**
 - a. Click **Convert to Additional Values**. All inconsistent objects will be converted to a single shared object with additional values.
 - b. Save your changes to affected network policies and devices and click **Confirm**.

Step 6 After resolving the inconsistencies, [Preview and Deploy Configuration Changes for All Devices](#) now the changes you made, or wait and deploy multiple changes at once.

Resolve Object Issues in Bulk

One way to resolve objects with [Resolve Unused Object Issues](#), [Resolve Duplicate Object Issues](#), or [Resolve Inconsistent Object Issues, on page 158](#) issues is to ignore them. You can select and ignore multiple objects, even if objects exhibit more than one issue. For example, if an object is both inconsistent and unused, you can only ignore one issue type at a time.



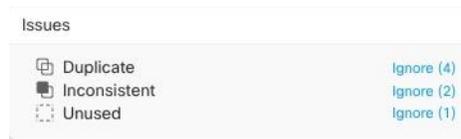
Important

If the object becomes associated with another issue type at a later time, the ignore action you committed only affects the issues you selected at that time. For example, if you ignored an object because it was a duplicate and the object is later marked inconsistent, ignoring it as a duplicate object does not mean it will be ignored as an inconsistent object.

To ignore issues in bulk, follow this procedure:

Procedure

- Step 1** In the CDO navigation bar on the left, click **Objects** and choose an option.
- Step 2** To narrow your search, you can [Object Filters](#) object issues.
- Step 3** In the Object table, select all the applicable objects you want to ignore. The Issues pane groups objects by issue type.



- Step 4** Click **Ignore** to ignore issues by type. You must **Ignore** each issue type separately.
- Step 5** Click **OK** to confirm you want to ignore those objects.

Device Connectivity States

You can view the connectivity states of the devices onboarded in your CDO tenant. This topic helps you understand the various connectivity states. On the **Inventory** page, the **Connectivity** column displays the device connectivity states.

When the device connectivity state is 'Online' it means that the device is powered on and connected to CDO. The other states described in the table below usually occur when the device is running into problems for various reasons. The table provides the method to recover from such problems. It may be that there is more than one problem causing the connection failure. When you attempt to reconnect, CDO will prompt you to fix all of these problems first before performing the reconnect.

Device Connectivity State	Possible Reasons	Resolution
Online	Device is powered on and connected to CDO.	NA
Offline	Device is powered down or lost network connectivity.	Check whether the device is offline.
Insufficient licenses	Device doesn't have sufficient licenses.	Troubleshoot Insufficient Licenses, on page 162
Invalid credentials	Username and password combination used by CDO to connect to the device is incorrect.	Troubleshoot Invalid Credentials, on page 162
Onboarding	Device onboarding is initiated but is not complete.	Check you device's connectivity and ensure you complete the device registration.

Device Connectivity State	Possible Reasons	Resolution
New Certificate Detected	Certificate on the device has changed. If the device uses a self-signed certificate, then this could have happened due to the device being power cycled.	Troubleshoot New Certificate Issues, on page 163
Onboarding Error	CDO may have lost connectivity with the device when onboarding it.	Troubleshoot Onboarding Error, on page 171

Troubleshoot Insufficient Licenses

If the device connectivity status shows "Insufficient License", do the following:

- Wait for some time until the device attains the license. Typically it takes some time for Cisco Smart Software Manager to apply a new license to the device.
- If the device status doesn't change, refresh the CDO portal by signing out from CDO and signing back to resolve any network communication glitch between license server and device.
- If the portal refresh doesn't change the device status, perform the following:

Procedure

-
- Step 1** Generate a new token from [Cisco Smart Software Manager](#) and copy it. You can watch the [Generate Smart Licensing](#) video for more information.
 - Step 2** In the CDO navigation bar, click the **Inventory** page.
 - Step 3** Click the **Devices** tab.
 - Step 4** Click the appropriate device type tab and select the device with the **Insufficient License** state.
 - Step 5** In the **Device Details** pane, click **Manage Licenses** appearing in **Insufficient Licenses**. The **Manage Licenses** window appears.
 - Step 6** In the **Activate** field, paste the new token and click **Register Device**.

Once the token is applied successfully to the device, its connectivity state turns to **Online**.

Troubleshoot Invalid Credentials

Perform the following to resolve device disconnection due to invalid credentials:

Procedure

-
- Step 1** Open the **Inventory** page.
 - Step 2** Click the **Devices** tab.

- Step 3** Click the appropriate device type tab and select the device with the **Invalid Credentials** state.
- Step 4** In the **Device Details** pane, click **Reconnect** appearing in **Invalid Credentials**. CDO attempts to reconnect with your device.
- Step 5** When prompted enter the new username and password for the device.
- Step 6** Click **Continue**.
- Step 7** After the device is online and ready to use, click **Close**.
- Step 8** It is likely that because CDO attempted to use the wrong credentials to connect to the device, the username and password combination CDO should use to connect to the device was changed directly on the device. You may now see that the device is "Online" but the configuration state is "Conflict Detected." Use [Resolve Configuration Conflicts](#) to review and resolve configuration differences between CDO and the device.
-

Troubleshoot New Certificate Issues

CDO's Use of Certificates

CDO checks the validity of certificates when connecting to devices. Specifically, CDO requires that:

1. The device uses a TLS version equal to or greater than 1.0.
2. The certificate presented by the device is not expired, and its issuance date is in the past (i.e. it is already valid, not scheduled to become valid at a later date).
3. The certificate must be a SHA-256 certificate. SHA-1 certificates will not be accepted.
4. One of these conditions is true:
 - The device uses a self-signed certificate, and it is the same as the most recent one trusted by an authorized user.
 - The device uses a certificate signed by a trusted Certificate Authority (CA), and provides a certificate chain linking the presented leaf certificate to the relevant CA.

These are the ways CDO uses certificates differently than browsers:

- In the case of self-signed certificates, CDO overrides the domain name check, instead checking that the certificate exactly matches the one trusted by an authorized user during device onboarding or reconnection.
- CDO does not yet support internal CAs. There is currently no way to check a certificate signed by an internal CA.

It is possible to disable certificate checking for ASA devices on a per-device basis. When an ASA's certificate cannot be trusted by CDO, you will have the option of disabling certificate checking for that device. If you have attempted to disable certificate checking for the device and you are still unable to onboard it, it is likely that the IP address and port you specified for the device is incorrect or unreachable. There is no way to disable certificate checking globally, or to disable certificate checking for a device with a supported certificate. There is no way to disable certificate checking for non-ASA devices.

When you disable certificate checking for a device, CDO will still use TLS to connect to the device, but it will not validate the certificate used to establish the connection. This means that a passive man-in-the-middle attacker will not be able to eavesdrop on the connection, but an active man-in-the-middle could intercept the connection by supplying CDO with an invalid certificate.

Identifying Certificate Issues

There are several reasons that CDO may not be able to onboard a device. When the UI shows a message that "CDO cannot connect to the device using the certificate presented," there is a problem with the certificate. When the UI does not show this message, the problem is more likely related to connectivity problems (the device is unreachable) or other network errors.

To determine why CDO rejects a given certificate, you can use the openssl command-line tool on the SDC host or another host that can reach the relevant device. Use the following command to create a file showing the certificates presented by the device:

```
openssl s_client -showcerts -connect <host>:<port> && <filename>.txt
```

This command will start an interactive session, so you will need to use Ctrl-c to exit after a couple of seconds.

You should now have a file containing output like the following:

```
depth=2 C = US, O = GeoTrust Inc., CN = GeoTrust Global CA
verify return:1
depth=1 C = US, O = Google Inc, CN = Google Internet Authority G2
verify return:1
depth=0 C = US, ST = California, L = Mountain View, O = Google Inc, CN = *.google.com
verify return:1 CONNECTED(00000003)
---
Certificate chain
0 s:/C=US/ST=California/L=Mountain View/O=Google Inc/CN=*.google.com
  i:/C=US/O=Google Inc/CN=Google Internet Authority G2
-----BEGIN CERTIFICATE-----
MIIH0DCCBrigAwIBAgIIUOMfH+8ftN8wDQYJKoZIhvcNAQELBQAwSTELMAkGA1UE
...lots of base64...
tzw9TylihJpZcl4qihFVTgFM7rMU2VHulpJgA59gdbaO/Bf
-----END CERTIFICATE-----
1 s:/C=US/O=Google Inc/CN=Google Internet Authority G2
  i:/C=US/O=GeoTrust Inc./CN=GeoTrust Global CA
-----BEGIN CERTIFICATE-----
MIID8DCCAtigAwIBAgIDAjQSMAGCSqGSIb3DQEBCwUAMEIxCzAJBgNVBAYTA1VT
...lots of base64...
tzw9TylihJpZcl4qihFVTgFM7rMU2VHulpJgA59gdbaO/Bf
-----END CERTIFICATE-----
2 s:/C=US/O=GeoTrust Inc./CN=GeoTrust Global CA
  i:/C=US/O=Equifax/OU=Equifax Secure Certificate Authority
-----BEGIN CERTIFICATE-----
MIIDftCCAuaqAwIBAgIDErvmMA0GCSqGSIb3DQEBBQUAME4xCzAJBgNVBAYTA1VT
...lots of base64...
b8ravHNjkOR/ez4iyz0H7V84dJzjA1BOoa+Y7mHyhD8S
-----END CERTIFICATE-----
---
Server certificate
subject=/C=US/ST=California/L=Mountain View/O=Google Inc/CN=*.google.com
issuer=/C=US/O=Google Inc/CN=Google Internet Authority G2
---
No client certificate CA names sent
Peer signing digest: SHA512
Server Temp Key: ECDH, P-256, 256 bits

---
SSL handshake has read 4575 bytes and written 434 bytes
---
New, TLSv1/SSLv3, Cipher is ECDHE-RSA-AES128-GCM-SHA256
Server public key is 2048 bit Secure Renegotiation IS supported
Compression: NONE
Expansion: NONE
No ALPN negotiated
SSL-Session:
```

```

Protocol : TLSv1.2
Cipher : ECDHE-RSA-AES128-GCM-SHA256
Session-ID: 48F046F3360225D51BE3362B50CE4FE8DB6D6B80B871C2A6DD5461850C4CF5AB
Session-ID-ctx:
Master-Key:
9A9CCBAA4F5A25B95C37EF7C6870F8C5DD3755A9A7B4CCE4535190B793DEFF53F94203AB0A62F9F70B9099FBFEBAB1B6

Key-Arg : None
PSK identity: None
PSK identity hint: None
SRP username: None
TLS session ticket lifetime hint: 100800 (seconds)
TLS session ticket:
0000 - 7a eb 54 dd ac 48 7e 76-30 73 b2 97 95 40 5b de z.T..H~v0s...@[.
0010 - f3 53 bf c8 41 36 66 3e-5b 35 a3 03 85 6f 7d 0c .S..A6f>[5...o}.
0020 - 4b a6 90 6f 95 e2 ec 03-31 5b 08 ca 65 6f 8f a6 K..o....1[...eo..
0030 - 71 3d c1 53 b1 29 41 fc-d3 cb 03 bc a4 a9 33 28 q=.S.)A.....3(
0040 - f8 c8 6e 0a dc b3 e1 63-0e 8f f2 63 e6 64 0a 36 ..n....c....c.d.6
0050 - 22 cb 00 3a 59 1d 8d b2-5c 21 be 02 52 28 45 9d "...:Y...!\...R(E.
0060 - 72 e3 84 23 b6 f0 e2 7c-8a a3 e8 00 2b fd 42 1d r..#...|....+.B.
0070 - 23 35 6d f7 7d 85 39 1c-ad cd 49 f1 fd dd 15 de #5m.}.9...I.....
0080 - f6 9c ff 5e 45 9c 7c eb-6b 85 78 b5 49 ea c4 45 ...^E.|.k.x.I..E
0090 - 6e 02 24 1b 45 fc 41 a2-87 dd 17 4a 04 36 e6 63 n.$..E.A....J.6.c
00a0 - 72 a4 ad
00a4 - <SPACES/NULS> Start Time: 1476476711 Timeout : 300 (sec)
Verify return code: 0 (ok)
---
```

The first thing to note in this output is the last line, where you see the **Verify return code**. If there is a certificate issue, the return code will be non-zero and there will be a description of the error.

Expand this list of certificate error code to see common errors and how to remediate them

- 0 X509_V_OK The operation was successful.
- 2 X509_V_ERR_UNABLE_TO_GET_ISSUER_CERT The issuer certificate of an untrusted certificate could not be found.
- 3 X509_V_ERR_UNABLE_TO_GET_CRL The CRL of a certificate could not be found.
- 4 X509_V_ERR_UNABLE_TO_DECRYPT_CERT_SIGNATURE The certificate signature could not be decrypted. This means that the actual signature value could not be determined rather than it not matching the expected value. This is only meaningful for RSA keys.
- 5 X509_V_ERR_UNABLE_TO_DECRYPT_CRL_SIGNATURE The CRL signature could not be decrypted. This means that the actual signature value could not be determined rather than it not matching the expected value. Unused.
- 6 X509_V_ERR_UNABLE_TO_DECODE_ISSUER_PUBLIC_KEY The public key in the certificate SubjectPublicKeyInfo could not be read.
- 7 X509_V_ERR_CERT_SIGNATURE_FAILURE The signature of the certificate is invalid.
- 8 X509_V_ERR_CRL_SIGNATURE_FAILURE The signature of the certificate is invalid.
- 9 X509_V_ERR_CERT_NOT_YET_VALID The certificate is not yet valid: the notBefore date is after the current time. See [Verify return code: 9 \(certificate is not yet valid\)](#) below for more information.
- 10 X509_V_ERR_CERT_HAS_EXPIRED The certificate has expired; that is, the notAfter date is before the current time. See [Verify return code: 10 \(certificate has expired\)](#) below for more information.
- 11 X509_V_ERR_CRL_NOT_YET_VALID The CRL is not yet valid.
- 12 X509_V_ERR_CRL_HAS_EXPIRED The CRL has expired.

- 13 X509_V_ERR_ERROR_IN_CERT_NOT_BEFORE_FIELD The certificate notBefore field contains an invalid time.
- 14 X509_V_ERR_ERROR_IN_CERT_NOT_AFTER_FIELD The certificate notAfter field contains an invalid time.
- 15 X509_V_ERR_ERROR_IN_CRL_LAST_UPDATE_FIELD The CRL lastUpdate field contains an invalid time.
- 16 X509_V_ERR_ERROR_IN_CRL_NEXT_UPDATE_FIELD The CRL nextUpdate field contains an invalid time.
- 17 X509_V_ERR_OUT_OF_MEM An error occurred trying to allocate memory. This should never happen.
- 18 X509_V_ERR_DEPTH_ZERO_SELF_SIGNED_CERT The passed certificate is self-signed and the same certificate cannot be found in the list of trusted certificates.
- 19 X509_V_ERR_SELF_SIGNED_CERT_IN_CHAIN The certificate chain could be built up using the untrusted certificates but the root could not be found locally.
- 20 X509_V_ERR_UNABLE_TO_GET_ISSUER_CERT_LOCALLY The issuer certificate of a locally looked up certificate could not be found. This normally means the list of trusted certificates is not complete.
- 21 X509_V_ERR_UNABLE_TO_VERIFY_LEAF_SIGNATURE No signatures could be verified because the chain contains only one certificate and it is not self-signed. See "Verify return code: 21 (unable to verify the first certificate)" below for more information. [Verify return code: 21 \(unable to verify the first certificate\)](#) below for more information.
- 22 X509_V_ERR_CERT_CHAIN_TOO_LONG The certificate chain length is greater than the supplied maximum depth. Unused.
- 23 X509_V_ERR_CERT_REVOKED The certificate has been revoked.
- 24 X509_V_ERR_INVALID_CA A CA certificate is invalid. Either it is not a CA or its extensions are not consistent with the supplied purpose.
- 25 X509_V_ERR_PATH_LENGTH_EXCEEDED The basicConstraints pathlength parameter has been exceeded.
- 26 X509_V_ERR_INVALID_PURPOSE The supplied certificate cannot be used for the specified purpose.
- 27 X509_V_ERR_CERT_UNTRUSTED The root CA is not marked as trusted for the specified purpose.
- 28 X509_V_ERR_CERT_REJECTED The root CA is marked to reject the specified purpose.
- 29 X509_V_ERR_SUBJECT_ISSUER_MISMATCH The current candidate issuer certificate was rejected because its subject name did not match the issuer name of the current certificate. Only displayed when the -issuer_checks option is set.
- 30 X509_V_ERR_AKID_SKID_MISMATCH The current candidate issuer certificate was rejected because its subject key identifier was present and did not match the authority key identifier current certificate. Only displayed when the -issuer_checks option is set.
- 31 X509_V_ERR_AKID_ISSUER_SERIAL_MISMATCH The current candidate issuer certificate was rejected because its issuer name and serial number were present and did not match the authority key identifier of the current certificate. Only displayed when the -issuer_checks option is set.
- 32 X509_V_ERR_KEYUSAGE_NO_CERTSIGN The current candidate issuer certificate was rejected because its keyUsage extension does not permit certificate signing.
- 50 X509_V_ERR_APPLICATION_VERIFICATION An application specific error. Unused.

New Certificate Detected

If you upgrade a device that has a self-signed certificate and a new certificate is generated after the upgrade process, CDO may generate a "New Certificate Detected" message as both a **Configuration Status** and **Connectivity** status. You must manually confirm and resolve this issue before you can continue managing it from CDO. Once the certificate is synchronized and the device is in a healthy state, you can manage the device.



Note When you [Bulk Reconnect Devices to CDO](#) more than one managed device to CDO at the same time, CDO automatically reviews and accepts the new certificates on the devices and continues to reconnect with them.

Use the following procedure to resolve a new certificate:

1. Navigate to the **Inventory** page.
2. Use the filter to display devices with a **New Certificate Detected** connectivity or configuration status and select the desired device.
3. In the action pane, click **Review Certificate**. CDO allows you to download the certificate for review and accept the new certificate.
4. In the Device Sync window, click **Accept** or in the Reconnecting to Device window, click **Continue**.

CDO automatically synchronizes the device with the new self-signed certificate. You may have to manually refresh the **Inventory** page to see the device once it's synched.

Certificate Error Codes

Verify return code: 0 (ok) but CDO returns certificate error

Once CDO has the certificate, it attempts to connect to the URL of the device by making a GET call to "https://<device_ip>:<port>". If this does not work, CDO will display a certificate error. If you find that the certificate is valid (openssl returns 0 ok) the problem may be that a different service is listening on the port you're trying to connect to. You can use the command:

```
curl -k -u <username>:<password> https://<device_id>:<device_port>/admin/exec/show%20version
```

to determine whether you are definitely talking to an ASA and check if HTTPS server running on the correct port on the ASA:

```
# show asp table socket
```

Protocol	Socket	State	Local Address	Foreign Address
SSL	00019b98	LISTEN	192.168.1.5:443	0.0.0.0:*
SSL	00029e18	LISTEN	192.168.2.5:443	0.0.0.0:*
TCP	00032208	LISTEN	192.168.1.5:22	0.0.0.0:*

Verify return code: 9 (certificate is not yet valid)

This error means that the issuance date of the certificate provided is in the future, so clients will not treat it as valid. This can be caused by a poorly-constructed certificate, or in the case of a self-signed certificate it can be caused by the device time being wrong when it generated the certificate.

You should see a line in the error including the notBefore date of the certificate:

```
depth=0 CN = ASA Temporary Self Signed Certificate
verify error:num=18:self signed certificate
verify return:1
depth=0 CN = ASA Temporary Self Signed Certificate
verify error:num=9:certificate is not yet valid
```

```
notBefore=Oct 21 19:43:15 2016 GMT
verify return:1
depth=0 CN = ASA Temporary Self Signed Certificate
notBefore=Oct 21 19:43:15 2016 GMT
```

From this error, you can determine when the certificate will become valid.

Remediation

The notBefore date of the certificate needs to be in the past. You can reissue the certificate with an earlier notBefore date. This issue can also arise when the time is not set correctly either on the client or issuing device.

Verify return code: 10 (certificate has expired)

This error means that at least one of the certificates provided has expired. You should see a line in the error including the notBefore date of the certificate:

```
error 10 at 0 depth lookup:certificate has expired
```

The expiration date is located in the certificate body.

Remediation

If the certificate is truly expired, the only remediation is to get another certificate. If the certificate's expiration is still in the future, but openssl claims that it is expired, check the time and date on your computer. For instance, if a certificate is set to expire in the year 2020, but the date on your computer is in 2021, your computer will treat that certificate as expired.

Verify return code: 21 (unable to verify the first certificate)

This error indicates that there is a problem with the certificate chain, and openssl cannot verify that the certificate presented by the device should be trusted. Let's look at the certificate chain from the example above to see how certificate chains should work:

```
---
Certificate chain
0 s:/C=US/ST=California/L=Mountain View/O=Google Inc/CN=*.google.com
i:/C=US/O=Google Inc/CN=Google Internet Authority G2

-----BEGIN CERTIFICATE-----
MIIH0DCCBrigAwIBAgIIUOMfH+8ftN8wDQYJKoZIhvcNAQELBQAwSTELMAkGA1UE
....lots of base64...
tzw9TyIimhJpZcl4qihFVTgFM7rMU2VHulpJgA59gdbaO/Bf
-----END CERTIFICATE-----

1 s:/C=US/O=Google Inc/CN=Google Internet Authority G2
i:/C=US/O=GeoTrust Inc./CN=GeoTrust Global CA

-----BEGIN CERTIFICATE-----
MIID8DCCAtigAwIBAgIDAjqSMA0GCSqGSIb3DQEBCwUAMEIxCzAJBgNVBAYTA1VT
....lots of base64...
tzw9TyIimhJpZcl4qihFVTgFM7rMU2VHulpJgA59gdbaO/Bf
-----END CERTIFICATE-----

2 s:/C=US/O=GeoTrust Inc./CN=GeoTrust Global CA
i:/C=US/O=Equifax/OU=Equifax Secure Certificate Authority

-----BEGIN CERTIFICATE-----
MIIDfTCCAuagAwIBAgIDErvmMA0GCSqGSIb3DQEBBQUAME4xCzAJBgNVBAYTA1VT
....lots of base64...
b8ravHNjkOR/ez4lyz0H7V84dJzjA1BOoa+Y7mHyhD8S
-----END CERTIFICATE-----
```

The certificate chain is a list of certificates presented by the server, beginning with the server's own certificate and then including increasingly higher-level intermediate certificates linking the server's certificate with a Certificate Authority's top-level certificate. Each certificate lists its Subject (the line starting with 's:' and its Issuer (the line starting with 'i').

The Subject is the entity identified by the certificate. It includes the Organization name and sometimes the Common Name of the entity for which the certificate was issued.

The Issuer is the entity that issued the certificate. It also includes an Organization field and sometimes a Common Name.

If a server had a certificate issued directly by a trusted Certificate Authority, it would not need to include any other certificates in its certificate chain. It would present one certificate that looked like:

```
--- Certificate chain 0 s:/C=US/ST=California/L=Anytown/O=ExampleCo/CN=*.example.com
i:/C=US/O=Trusted Authority/CN=Trusted Authority
-----BEGIN CERTIFICATE-----
MIIH0DCCBrigAwIBAgIIUOMfH+8ftN8wDQYJKoZIhvcNAQELBQAwSTELMAkGA1UE
...lots of base64...
tzw9TyIimhJpZcl4qihFVTgFM7rMU2VHulpJgA59gdbaO/Bf
-----END CERTIFICATE----- ---
```

Given this certificate, openssl would verify that the ExampleCo certificate for *.example.com was correctly signed by the Trusted Authority certificate, which would be present in openssl's built-in trust store. After that verification, openssl would successfully connect to the device.

However, most servers do not have certificates signed directly by a trusted CA. Instead, as in the first example, the server's certificate is signed by one or more intermediates, and the highest-level intermediate has a certificate signed by the trusted CA. OpenSSL does not trust these intermediate CAs by default, and can only verify them if it is given a complete certificate chain ending in a trusted CA.

It is critically important that servers whose certificates are signed by intermediate authorities supply ALL the certificates linking them to a trusted CA, including all of the intermediate certificates. If they don't supply this entire chain, the output from openssl will look something like this:

```
depth=0 OU = Example Unit, CN = example.com
verify error:num=20:unable to get local issuer certificate
verify return:1

depth=0 OU = Example Unit, CN = example.com
verify error:num=27:certificate not trusted
verify return:1

depth=0 OU = Example Unit, CN = example.com
verify error:num=21:unable to verify the first certificate
verify return:1

CONNECTED(00000003)

---
Certificate chain
0 s:/OU=Example Unit/CN=example.com
i:/C=US/ST=Massachusetts/L=Cambridge/O=Intermediate
Authority/OU=http://certificates.intermediateauth...N=Intermediate Certification
Authority/sn=675637734
-----BEGIN CERTIFICATE-----
...lots of b64...
-----END CERTIFICATE-----
---
Server certificate
subject=/OU=Example Unit/CN=example.com
issuer=/C=US/ST=Massachusetts/L=Cambridge/O=Intermediate
```

```

Authority/OU=http://certificates.intermediateauth...N=Intermediate Certification
Authority/sn=675637734
---
No client certificate CA names sent
---
SSL handshake has read 1509 bytes and written 573 bytes
---
New, TLSv1/SSLv3, Cipher is AES256-SHA
Server public key is 2048 bit
Secure Renegotiation IS NOT supported
Compression: NONE
Expansion: NONE
SSL-Session:
Protocol : TLSv1
Cipher : AES256-SHA
Session-ID: 24B45B2D5492A6C5D2D5AC470E42896F9D2DDDD54EF6E3363B7FDA28AB32414B
Session-ID-ctx:
Master-Key:
21BAF9D2E1525A5B935BF107DA3CAF691C1E499286CBEA987F64AE5F603AAF8E65999BD21B06B116FE9968FB7C62EF7C

Key-Arg : None
Krb5 Principal: None
PSK identity: None
PSK identity hint: None
Start Time: 1476711760
Timeout : 300 (sec)
Verify return code: 21 (unable to verify the first certificate)
---

```

This output shows that the server only provided one certificate, and the provided certificate was signed by an intermediate authority, not a trusted root. The output also shows the characteristic verification errors.

Remediation

This problem is caused by a misconfigured certificate presented by the device. The only way to fix this so that CDO or any other program can securely connect to the device is to load the correct certificate chain onto the device, so that it will present a complete certificate chain to connecting clients.

To include the intermediate CA to the trustpoint follow one of the links below (depending on your case - if CSR was generated on the ASA or not):

- <https://www.cisco.com/c/en/us/support/docs/security-vpn/public-key-infrastructure-pki/200339-Configure-ASA-SSL-Digital-Certificate-I.html#anc13>
- <https://www.cisco.com/c/en/us/support/docs/security-vpn/public-key-infrastructure-pki/200339-Configure-ASA-SSL-Digital-Certificate-I.html#anc15>

New Certificate Detected

If you upgrade a device that has a self-signed certificate and a new certificate is generated after the upgrade process, CDO may generate a "New Certificate Detected" message as both a **Configuration Status** and **Connectivity** status. You must manually confirm and resolve this issue before you can continue managing it from CDO. Once the certificate is synchronized and the device is in a healthy state, you can manage the device.



Note When you [Bulk Reconnect Devices to CDO](#) more than one managed device to CDO at the same time, CDO automatically reviews and accepts the new certificates on the devices and continues to reconnect with them.

Use the following procedure to resolve a new certificate:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
 - Step 2** Click the **Devices** tab.
 - Step 3** Click the appropriate device type tab.
 - Step 4** Use the filter to display devices with a **New Certificate Detected** connectivity or configuration status and select the desired device.
 - Step 5** In the action pane, click **Review Certificate**. CDO allows you to download the certificate for review and accept the new certificate.
 - Step 6** In the Device Sync window, click **Accept** or in the Reconnecting to Device window, click **Continue**.
-

CDO automatically synchronizes the device with the new self-signed certificate. You may have to manually refresh the **Inventory** page to see the device once it's synced.

Troubleshoot Onboarding Error

The device onboarding error can occur for various reasons.

You can take the following actions:

Procedure

- Step 1** On the **Inventory** page, click the **Devices** tab.
 - Step 2** Click the appropriate device type tab and select the device running into this error. In some cases, you will see the error description on the right. Take the necessary actions mentioned in the description.
Or
 - Step 3** Remove the device instance from CDO and try onboarding the device again.
-

Resolve the Conflict Detected Status

CDO allows you to enable or disable conflict detection on each live device. If [Conflict Detection, on page 124](#) is enabled and there was a change made to the device's configuration without using CDO, the device's configuration status will show **Conflict Detected**.

To resolve a "Conflict Detected" status, follow this procedure:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Note** For an On-Prem Firewall Management Center, navigate **Tools & Services > Firewall Management Center** and select the FMC that is in **Conflict Detected** state and continue from Step 4.

- Step 2** Click the **Devices** tab to locate your device.
- Step 3** Click the appropriate device type tab.
- Step 4** Select the device reporting the conflict and click **Review Conflict** in the details pane on the right.
- Step 5** In the **Device Sync** page, compare the two configurations by reviewing the highlighted differences.
- The panel labeled "Last Known Device Configuration" is the device configuration stored on CDO.
 - The panel labeled "Found on Device" is the configuration stored in the running configuration on the ASA.
- Step 6** Resolve the conflict by selecting one of the following:
- **Accept Device changes:** This will overwrite the configuration **and any pending changes stored on CDO** with the device's running configuration.

Note As CDO does not support deploying changes to the Cisco IOS devices outside of the command line interface, your only choice for a Cisco IOS device will be to select **Accept Without Review** when resolving the conflict.
 - **Reject Device Changes:** This will overwrite the configuration stored on the device with the configuration stored on CDO.
- Note** All configuration changes, rejected or accepted, are recorded in the change log.
-

Resolve the Not Synced Status

Use the following procedure to resolve a device with a "Not Synced" Configuration Status:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Note** For an On-Prem Firewall Management Center, navigate **Tools & Services > Firewall Management Center** and select the FMC that is in **Not Synced** state and continue from Step 5.
- Step 2** Click the **Devices** tab to locate the device or the **Templates** tab to locate the model device.
- Step 3** Click the appropriate device type tab.
- Step 4** Select the device reported as Not Synced.
- Step 5** In the **Not synced** panel to the right, select either of the following:
- **Preview and Deploy...** -If you want to push the configuration change from CDO to the device, [Preview and Deploy Configuration Changes for All Devices](#) the changes you made now, or wait and deploy multiple changes at once.

- **Discard Changes** -If you do **not** want to push the configuration change from CDO to the device, or you want to "undo" the configuration changes you started making on CDO. This option overwrites the configuration stored in CDO with the running configuration stored on the device.
-



CHAPTER 7

FAQ and Support

This chapter contains the following sections:

- [Cisco Defense Orchestrator, on page 175](#)
- [FAQ About Onboarding Devices to Cisco Defense Orchestrator, on page 176](#)
- [Device Types, on page 177](#)
- [Security, on page 179](#)
- [Troubleshooting, on page 180](#)
- [Terminologies and Definitions used in Low-Touch Provisioning, on page 180](#)
- [Policy Optimization, on page 181](#)
- [Connectivity, on page 181](#)
- [About Data Interfaces, on page 182](#)
- [How CDO Processes Personal Information, on page 182](#)
- [Contact Cisco Defense Orchestrator Support, on page 182](#)

Cisco Defense Orchestrator

What is Cisco Defense Orchestrator?

Cisco Defense Orchestrator (CDO) is a cloud-based multi-device manager that allows network administrators to create and maintain consistent security policies across various security devices.

You can use CDO to manage these devices:

- Cisco Secure Firewall ASA
- Cisco Secure Firewall Threat Defense
- Cisco Umbrella
- Meraki
- Cisco IOS devices
- Amazon Web Services (AWS) instances
- Devices administered using an SSH connection

CDO administrators can monitor and maintain all these device types through a single interface.

FAQ About Onboarding Devices to Cisco Defense Orchestrator

FAQs About Onboarding Secure Firewall ASA to CDO

How do I onboard an ASA using credentials?

You can onboard ASAs one at a time or in a bulk operation. device at a time. When onboarding an ASA that is part of a high-availability pair, use [Onboard an ASA Device](#) to onboard only the primary device of the pair. The method of onboarding a security context or admin context is the same for onboarding any other ASA.

How do I onboard more than one ASA at a time?

You can create a list of ASAs using a CSV file, and CDO will onboard all the ASAs in the list. See [Onboard ASAs in Bulk](#) for instructions on how to bulk onboard ASAs.

What do I do after onboarding my ASAs?

See [Managing ASA with Cisco Defense Orchestrator](#) to get started.

FAQs About Onboarding FDM-Managed Devices to CDO

How do I onboard FDM-managed devices?

There are different methods of onboarding an FDM-managed device. We recommend using the registration key method. See [Onboard an FDM-Managed Device](#) to get started.

FAQs About Onboarding Secure Firewall Threat Defense to Cloud-delivered Firewall Management Center

How do I onboard Secure Firewall Threat Defense?

You can onboard an FTD device using a CLI registration key, through low-touch provisioning, or with a serial number.

What do I do after onboarding my Secure Firewall Threat Defense?

Once the device is synchronized, navigate to Tools & Services > Firewall Management Center and select an action from the Actions, Management, or Settings pane to begin configuring your threat defense device in cloud-delivered Firewall Management Center. See [Cloud-delivered Firewall Management Center Application Page](#) to get started.

How do I troubleshoot my Secure Firewall Threat Defense?

See [Troubleshoot Onboarding your Secure Firewall Threat Defense](#).

FAQs About On-Premises Secure Firewall Management Center

How do I onboard an On-Prem management center?

You can onboard an On-Prem Management Center to CDO. Onboarding an On-Prem Management Center also onboards all of the devices registered to the On-Prem Management Center. CDO does not support creating or modifying objects or policies associated with the On-Prem Management Center or the devices registered to the On-Prem Management Center. You must make these changes in the On-Prem Management Center UI. See [Onboard an On-Prem Management Center](#) to get started.

FAQs About Onboarding Meraki Devices to CDO

How do I onboard a Meraki device?

MX devices can be managed by both CDO and the Meraki dashboard. CDO deploys configuration changes to the Meraki dashboard, which in turn deploys the configuration securely to the device. See [Onboard Meraki MX Devices](#) to get started.

FAQs About Onboarding SSH Devices to CDO

How do I onboard an SSH device?

You can use the username and password of a highly privileged user stored on the SSH device to onboard the device with a Secure Device Connector (SDC). See [Onboard an SSH Device](#) to get started.

How do I delete a device?

You can delete a device from the inventory page.

FAQs About Onboarding IOS Devices to CDO

How do I onboard a Cisco IOS device?

You can onboard a live Cisco device running Cisco IOS (Internetwork Operating System) with a Secure Device Connector (SDC). See [Onboard a Cisco IOS Device](#) to get started.

How do I delete a device?

You can delete a device from the Inventory page.

Device Types

What is an Adaptive Security Appliance (ASA)?

The Cisco ASA provides advanced stateful firewall and VPN concentrator functionality in one device as well as integrated services with add-on modules. The ASA includes many advanced features, such as multiple security contexts (similar to virtualized firewalls), clustering (combining multiple firewalls into a single

firewall), transparent (Layer 2) firewall or routed (Layer 3) firewall operation, advanced inspection engines, IPsec VPN, SSL VPN, and clientless SSL VPN support, and many more features. ASAs can be installed on virtual machines or supported hardware.

What is an ASA Model?

An ASA model is a copy of the running configuration file of an ASA device that you have onboarded to CDO. You can use an ASA model to analyze the configuration of an ASA device without onboarding the device itself.

When is a device Synced?

When the configuration on CDO and the configuration stored locally on the device are the same.

When is a device Not Synced?

When the configuration stored in CDO was changed and it is now different than the configuration stored locally on the device.

When is a device in a Conflict Detected state?

When the configuration on the device was changed outside of CDO (out-of-band), and is now different than the configuration stored on CDO.

What is an out-of-band change?

When a change is made to the device outside of CDO. The change is made directly on the device using CLI command or by using the on-device manager such as ASDM or FDM. An out-of-band change causes CDO to report a "Conflict Detected" state for the device.

What does it mean to deploy a change to a device?

After you onboard a device to CDO, CDO maintains a copy of its configuration. When you make a change on CDO, CDO makes a change to its copy of the device's configuration. When you "deploy" that change back to a device, CDO copies the changes you made to the device's copy of its configuration. See these topics:

- [Preview and Deploy Configuration Changes for All Devices, on page 118](#)

What ASA commands are currently supported?

All commands. Click the **Command Line Interface** link under Device Actions to use the ASA CLI.

Are there any scale limitations for device management?

CDO's cloud architecture allows it to scale to thousands of devices.

Does CDO manage Cisco Integrated Services Routers and Aggregation Services Routers?

CDO allows you to create a model device for ISRs and ASRs and import its configuration. You can then create templates based on the imported configurations and export the configuration as a standardized configuration that can be deployed to new or existing ISR and ASR devices for consistent security.

Can CDO manage SMA?

No, CDO does not currently manage SMA.

Security

Is CDO Secure?

CDO offers end-to-end security for customer data through the following features:

- [Initial Login to Your New CDO Tenant, on page 3](#)
- Authentication calls for APIs and database operations
- Data isolation in flight and at rest
- Separation of roles

CDO requires multi-factor authentication for users to connect to their cloud portal. Multi-factor authentication is a vital function needed to protect the identity of customers.

All data, in flight and at rest, is encrypted. Communication from devices on customer premises and CDO is encrypted with SSL, and all customer-tenant data volumes are encrypted.

CDO's multi-tenant architecture isolates tenant data and encrypts traffic between databases and application servers. When users authenticate to gain access to CDO, they receive a token. This token is used to fetch a key from a key-management service, and the key is used to encrypt traffic to the database.

CDO provides value to customers quickly while making sure customer credentials are secured. This is achieved by deploying a "Secure Data Connector" in the cloud or a customer's own network (in roadmap) that controls all inbound and outbound traffic to make sure the credential data doesn't leave the customer premises.

I received the error "Could not validate your OTP" when logging into CDO for the first time

Check that your desktop or mobile device clock is synchronized with a world time server. Clocks being out of sync by less or more than a minute can cause incorrect OTPs to be generated.

Is my device connected directly to Cisco Defense Orchestrator cloud platform?

Yes. The secured connection is performed using the CDO SDC which is used as a proxy between the device and CDO platform. CDO architecture, designed with security first in mind, enables having complete separation between data traversing back and forth to the device.

How can I connect a device which does not have a public IP address?

You can leverage CDO [Secure Device Connector](#) which can be deployed within your network and doesn't need any outside port to be open. Once the SDC is deployed you can onboard devices with internal (non-internet routable) IP addresses.

Does the SDC require any additional cost or license?

No.

How can I check the tunnel status? State options

CDO performs the tunnel connectivity checks automatically every hour, however ad-hoc VPN tunnel connectivity checks can be performed by choosing a tunnel and requesting to check connectivity. Results may take several seconds to process.

Can I search a tunnel based on the device name as well as its IP address of one of its peers?

Yes. Search and pivot to a specific VPN tunnel details by using available filters and search capabilities on both name and the peers IP addresses.

Troubleshooting

While performing complete deploy of device configuration from CDO to managed device, I get a warning "Cannot deploy changes to device". What can I do to solve that?

If an error occurs when you deploy a full configuration (changes performed beyond CDO supported commands) to the device, click "Check for changes" to pull the latest available configuration from device. This may solve the problem and you will be able to continue making changes on CDO and deploy them. In case the issue persists, please contact Cisco TAC from the **Contact Support** page.

While resolving out-of-band issue (changes performed outside of CDO; directly to a device), comparing the configuration present in CDO that of the device, CDO presents additional metadata that were not added or modified by me. Why?

As CDO expands its functionality, additional information will be collected from the device's configuration to enrich and maintain all required data for better policy and device management analysis. These are not changes that occurred on managed device but already existing information. Resolving the conflict detected state can be easily solved by checking for changes from the device and reviewing the changes occurred.

Why is CDO rejecting my certificate?

See [Troubleshoot New Certificate Issues](#)

Terminologies and Definitions used in Low-Touch Provisioning

- **Claimed** - Used in the context of serial number onboarding in CDO. A device is "claimed" if its serial number has been onboarded to a CDO tenant.
- **Parked** - Used in the context of serial number onboarding in CDO. A device is "parked" if it has connected to the Cisco Cloud, and a CDO tenant has not claimed its serial number.
- **Initial provisioning** - Used in the context of the initial FTD setup. During this phase, the device accepts EULA, creates a new password, configures management IP address, sets FQDN, sets DNS servers, and chooses to manage the device locally with FDM.
- **Low-touch provisioning** - It is the process of shipping an FTD from the factory to a customer site (typically a branch office), an employee at the site connects the FTD to their network, and the device contacts the Cisco Cloud. At that point, the device is onboarded to CDO tenant if its serial number has already been "claimed," or the FTD is "parked" in the Cisco cloud until a CDO tenant claims it.

- **Serial number onboarding** - It is the process of onboarding an FTD using its serial number that has already been configured (installed and setup).

Policy Optimization

How can I identify a case when two or more access lists (within the same access group) are shadowing each other?

Cisco Defense Orchestrator Network Policy Management (NPM) is able to identify and alert the user if within a rule set, a rule higher in order, is shadowing a different rule. User can either navigate between all network policies or filter to identify all shadow issues.



Note CDO supports only fully shadowed rules.

Connectivity

The Secure Device Connector changed IP address, but this was not reflected within CDO. What can I do to reflect the change?

In order to obtain and update the new Secure Device Connector (SDC) within CDO, you will need to restart the container using the following commands:

```
Stop Docker daemon>#service docker stop
Change IP address
Start Docker daemon >#service docker start
Restart container on the SDC virtual appliance >bash-4.2$ ./cdo/toolkit/toolkit.sh restartSDC
<tenant-name>
```

What happens if the IP address used by CDO to manage my devices (FTD or ASA) changes?

If the IP address of the device changes for any reason, whether it is a change in the static IP address or a change in the IP address due to DHCP, you can change the IP address that CDO uses to connect to the device (see [Changing a Device's IP Address in CDO, on page 76](#)) and then reconnect the device (see [Bulk Reconnect Devices to CDO, on page 81](#)). When reconnecting the device you will be asked to enter the new IP address of the device as well as re-enter the authentication credentials.

What networking is required to connect my ASA to CDO?

- ASDM image present and enabled for ASA.
- Public interface access to 52.25.109.29, 52.34.234.2, 52.36.70.147
- ASA's HTTPS port must be set to 443 or to a value of 1024 or higher. For example, it cannot be set to port 636.
- If the ASA under management is also configured to accept AnyConnect VPN Client connections, the ASA HTTPS port must be changed to a value of 1024 or higher.

About Data Interfaces

You can use either the dedicated management interface or a regular data interface for communication with the device. CDO access on a data interface is useful if you want to manage the FTD remotely from the outside interface, or you do not have a separate management network. CDO supports high availability on the FTD managed remotely from the data interface.

FTD management access from a data interface has the following limitations:

- You can only enable manager access on one physical, data interface. You cannot use a subinterface or EtherChannel.
- Routed firewall mode only, using a routed interface.
- PPPoE is not supported. If your ISP requires PPPoE, you will have to put a router with PPPoE support between the FTD and the WAN modem.
- The interface must be in the global VRF only.
- SSH is not enabled by default for data interfaces, so you will have to enable SSH later using CDO. Because the management interface gateway will be changed to be the data interfaces, you also cannot SSH to the management interface from a remote network unless you add a static route for the management interface using the **configure network static-routes** command.

How CDO Processes Personal Information

To learn how Cisco Defense Orchestrator processes your personal identifiable information, see the [Cisco Defense Orchestrator Privacy Data Sheet](#).

Contact Cisco Defense Orchestrator Support

This chapter covers the following sections:

Export The Workflow

We strongly recommend exporting the workflow of a device that is experience issues prior to opening a support ticket. This additional information can help the support team expeditiously identify and correct any troubleshooting efforts.

Use the following procedure to export the workflow:

Procedure

- Step 1** In the navigation bar, click **Inventory**.
- Step 2** Click the **Devices** tab to locate your device.
- Step 3** Click the appropriate device type tab and select the device you need to troubleshoot.

Use the **filter** or **search bar** to locate the device you need to troubleshoot. Select the device so it is highlighted.

- Step 4** In the **Device Actions** pane, select **Workflows**.
- Step 5** Click the **Export** button located at the top right of the page, above the table of events. The file automatically saves locally as a **.json** file. Attach this to any emails or tickets you open with TAC.

Open a Support Ticket with TAC

A customer using a 30-day trial or a licensed CDO account can open a support ticket with Cisco's Technical Assistance Center (TAC).

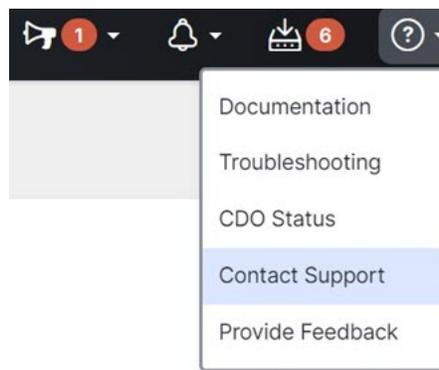
- [How CDO Customers Open a Support Ticket with TAC.](#)
- [How CDO Trial Customers Open a Support Ticket with TAC.](#)

How CDO Customers Open a Support Ticket with TAC

This section explains how a customer using a licensed CDO tenant can open a support ticket with Cisco's Technical Assistance Center (TAC).

Procedure

- Step 1** Log in to CDO.
- Step 2** Next to your tenant name, click the help button and select **Contact Support**.



- Step 3** Click **Support Case Manager**.
- Step 4** Click the blue **Open New Case** button.
- Step 5** Click **Open Case**.
- Step 6** Select **Products and Services** and then click **Open Case**.
- Step 7** Choose a **Request Type**.
- Step 8** Expand **Find Product by Service Agreement** row.
- Step 9** Fill in all the fields. Many of the fields are obvious. This is some additional information:
- **Product Name (PID)** - If you no longer have this number, see the [Cisco Defense Orchestrator Data Sheet](#).

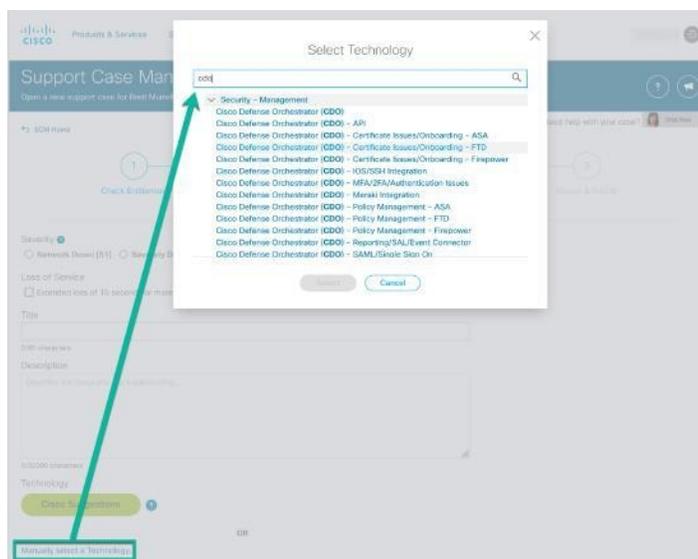
- **Product Description** - This is the description of the PID.
- **Site Name** - Enter your site name. If you are a Cisco Partner opening a case for one of your customers, enter the customer's name.
- **Service Contract** - Enter your service contract number.
 - **Important:** In order for your case to be associated with your Cisco.com account, you need to associate your contract number to your Cisco.com profile. Use this procedure to associate your contract number to your Cisco.com profile.
 - a. Open to [Cisco Profile Manager](#).
 - b. Click the **Access Management** tab.
 - c. Click **Add Access**.
 - d. Choose **TAC and RMA case creation, Software Download, support tools, and entitled content on Cisco.com** and click **Go**.
 - e. Enter service contracts number(s) in the space provided and click **Submit**. You will receive notification via email that the service contract associations have been completed. Service contract association can take up to 6 hours to complete.

Important Important: If you are not able to access any of the links below, please contact your authorized Cisco partner or re-seller, your Cisco account representative, or the individual in your company who manages Cisco service agreement information.

Step 10 Click **Next**.

Step 11 In the **Describe Problem** screen, scroll down to **Manually select a Technology**, click it, and type **CDO** in the search field.

Step 12 Select the category that best matches your request, and click **Select**.



Step 13 Complete the remainder of the service request and click **Submit**.

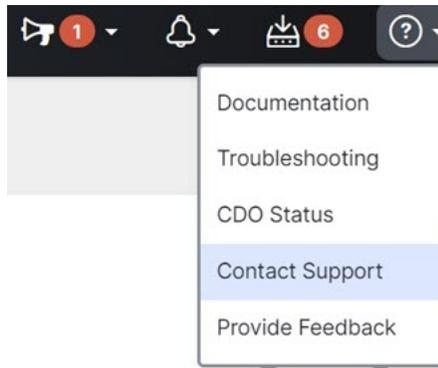
How CDO Trial Customers Open a Support Ticket with TAC

This section explains how a customer using a free trial of a CDO tenant can open a support ticket with Cisco's Technical Assistance Center (TAC).

Procedure

Step 1 Log in to CDO.

Step 2 Next to your tenant and account name, click the help button and select **Contact Support**.



Step 3 In the **Enter Issue or request below** field, specify the issue that you are facing or your request and click **Submit**.

Your request, along with the technical information, will be sent to the support team, and a technical support engineer will respond to your query.

CDO Service Status Page

CDO maintains a customer-facing service status page that shows you if the CDO service is up and any service interruptions it may have had. You can view up-time information with daily, weekly, or monthly graphs.

You can reach the CDO status page by clicking [CDO Status](#) in the help menu on any page in CDO.

On the status page, you can click the **Subscribe to Updates** to receive a notification if the CDO service goes down.

