

Cisco Optical Network Controller Configuration Guide, Release 1.1

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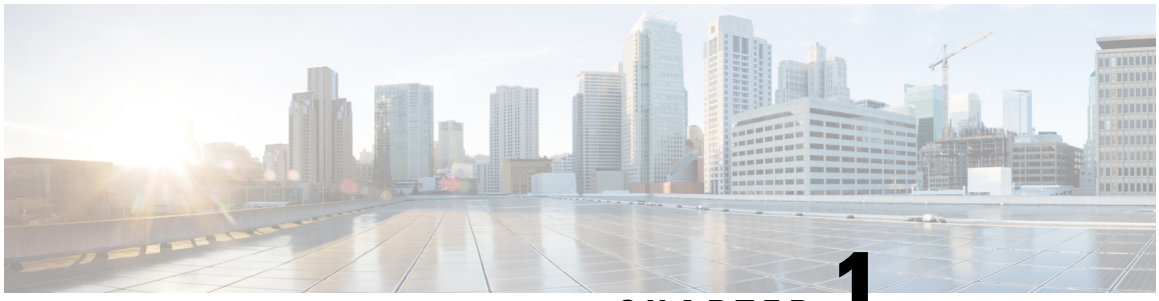
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CHAPTER 1

Overview of Cisco Optical Network Controller

This section contains the following topics:

- Cisco Optical Network Controller Overview, on page 1

Cisco Optical Network Controller Overview

Cisco Optical Network Controller (Cisco ONC) is an SDN Domain Controller for Cisco optical networks. Cisco Optical Network Controller behaves as a Provisioning Network Controller (PNC) and performs the following functions:

- collects information about the inventory and topology of the managed network,
- monitors the topology (physical or virtual) of the network,
- notifies of changes topology and service changes, and
- supports optical path creation and deletion.

Cisco Optical Network Controller collects relevant data needed for optical applications. This data is also used to provide abstracted network information to higher layer controllers, thus enabling a centralized control of optical network.

Some of the functions supported by Cisco Optical Network Controller are:

- Optical Domain Controller

  Cisco Optical Network Controller behaves as a domain controller for Cisco optical products. The domain controller feeds data into hierarchical controllers. Optical Network Controller has a North Bound Interface (NBI) based on the TAPI standard which enables it to connect to any hierarchical controller which has a TAPI compliant South Bound Interface and provide its functions to the controller.

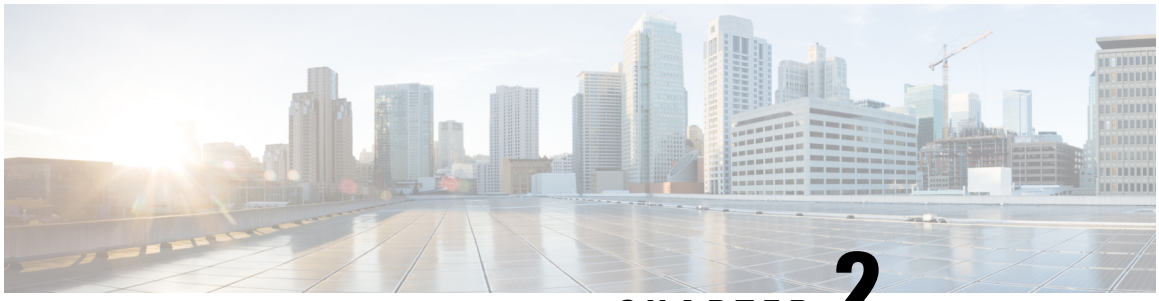
- Path Compute Engine (PCE)

  PCE service provides optical path computation to ensure optically valid paths within supplied constraints are provisioned. PCE uses the up-to-date network status.

- Model Based Network Abstraction

  Cisco Optical Network Controller supports a standardized TAPI model which enables it to abstract the device level details from the hierarchical controller.

See Cisco Optical Network Controller (CONC) Data Sheet for more information on Cisco Optical Network Controller.



CHAPTER 2

Install Cisco Optical Network Controller

This section contains the following topics:

- Installation Requirements, on page 3
- Install Cisco Optical Network Controller, on page 7
- Log into Cisco Optical Network Controller, on page 8
- Uninstall Cisco Optical Network Controller, on page 8

Installation Requirements

Before installing Cisco Optical Network Controller, you must install Cisco Crosswork Infrastructure 4.04.1.

The infrastucture requirements for installing Cisco Crosswork are listed below. For complete installation requirements, see the *Cisco Crosswork Infrastructure 4.0 and Applications Installation GuideCisco Crosswork Infrastructure 4.1 and Applications Installation Guide*.

Data Center Requirements

Cisco Crosswork can be deployed in either a vCenter managed data center or onto Cisco CSP. To aid in the deployment, Cisco has developed a cluster installation tool. This tool works in both environments. However, there are limitations to the tool which are detailed later in this section.

Note

- The machine where you run the installer must have network connectivity to the data center (vCenter or CSP) where you plan to install the cluster. If this mandatory requirement cannot be met, you must manually install the cluster.
- Cisco Crosswork cluster VMs (Hybrid nodes and Worker nodes) must be hosted on hardware with Hyper Threading disabled.
- Ensure that the host resources are not oversubscribed (in terms of CPU or memory).

VMware Data Center Requirements

This section explains the data center requirements to install Cisco Crosswork on VMware vCenter.

Note The following requirements are mandatory if you are planning to install Cisco Crosswork using the cluster installer. If your vCenter data center does not meet these requirements, then the VMs have to be deployed individually, and connectivity has to be established manually between the VMs.

- Hypervisor and vCenter supported:
  - VMware vSphere 6.7 or above
  - VMware vCenter Server 7.0 and ESXi 7.0.
  - VMware vCenter Server 6.7 (Update 3g or later) and ESXi 6.7 (Update 1)
- All the physical host machines must be organized within the same VMware Data Center, and while it is possible to deploy all the cluster nodes on a single physical host (provided it meets the requirements), it is recommended that the nodes be distributed across multiple physical hosts.
- The networks required for the Crosswork Management and Data networks need to be built and configured in the data centers, and must allow low latency L2 communication.
- To allow use of VRRP, DVS Port group needs to be set as follows:

Property	Value
Promiscuous mode	Reject
MAC address changes	Reject
Forged transmits	Accept

- Ensure the user account you use for accessing vCenter has the following privileges:
  - VM (Provisioning): Clone VM on the VM you are cloning.
  - VM (Provisioning): Customize on the VM or VM folder if you are customizing the guest operating system.
  - VM (Provisioning): Read customization specifications on the root vCenter server if you are customizing the guest operating system.
  - VM (Inventory): Create from the existing VM on the data center or VM folder.
  - VM (Configuration): Add new disk on the data center or VM folder.
  - Resource: Assign VM to resource pool on the destination host, cluster, or resource pool.
  - Datastore: Allocate space on the destination datastore or datastore folder.
  - Network: Assign network to which the VM will be assigned.
  - Profile-driven storage (Query): This permission setting needs to be allowed at the root of the DC tree level.
- We also recommend you to enable vCenter storage control.

CSP Data Center Requirements

This section explains the data center requirements to install Cisco Crosswork on Cisco Cloud Services Platform (CSP).

- Cisco CSP, Release 2.8.0.276
- Compatible hardware:

UCSC-C220-M4S, UCSC-C240-M4SX
N1K-1110-X, N1K-1110-S
CSP-2100, CSP-2100-UCSD, CSP-2100-X1, CSP-2100-X2
CSP-5200, CSP-5216, CSP-5228
CSP-5400, CSP-5436, CSP-5444, CSP-5456

- CSP host or cluster is setup and installed with a minimum of two physical ethernet interfaces - one ethernet connected to the Management network, and the other to the Data network.

VM Host Requirements

This section explains the VM host requirements.

Table 1: VM Host Requirements

Requirement	Description
CPU/Memory/Storage Profiles (per VM)	The data center host platform has to accommodate three VMs of the following minimum configuration: **VMware vCenter:** • Large: 12 vCPUs | 96 GB RAM Memory | 1 TB disk space **Cisco CSP:** • Large: 12 CPU cores | 96 GB RAM Memory | 1 TB disk space **Note** For assistance in adjusting VM Memory and CPU sizes post installation, contact your Cisco Customer Experience team. Few things to note: • Storage requirements vary based on factors such as the number of devices being supported and the type of deployment selected. However, 1 TB disk space should work for most deployments. • Due to their performance, solid state drives (SSD) are preferred over traditional hard disk drives (HDD). • If you are using HDD, the minimum speed should be over 10,000 RPM. • The VM data store(s) need to have disk access latency of < 10 ms.

Requirement	Description
Additional Storage	10 GB (approximately) of storage is required for the Crosswork OVA (in **vCenter**), OR the Crosswork QCOW2 image on each CSP node (in **CSP**).
Network Connections	For production deployments, we recommend that you use dual interfaces, one for the Management network and one for the Data network. For optimal performance, the Management and Data networks should use links configured at a minimum of 10 Gbps.
IP Addresses	Two IP subnets, one for the Management network and one for Data network, with each allowing a minimum of four assignable IP addresses (IPv4 or IPv6). A Virtual IP (VIP) address is used to access the cluster, and then three IP addresses for each VM in the cluster. If your deployment requires worker nodes, you will need a Management and Data IP address for each worker node. • The IP addresses must be able to reach the gateway address for the network where Cisco Crosswork Data Gateway will be installed, or the installation will fail. • When deploying a IPv6 cluster, the installer needs to run on an IPv6 enabled container/VM. • At this time, your IP allocation is permanent and cannot be changed without re-deployment. For more information, contact your Cisco Customer Experience team.
NTP Servers	The IPv4 or IPv6 addresses or host names of the NTP servers you plan to use. If you want to enter multiple NTP servers, separate them with spaces. These should be the same NTP servers you use to synchronize the Crosswork application VM clock, devices, clients, and servers across your network. • Ensure that the NTP servers are reachable on the network before attempting installation. The installation will fail if the servers cannot be reached. • The ESXi hosts that will run the Crosswork application and Crosswork Data Gateway VM must have NTP configured, or the initial handshake may fail with "certificate not valid" errors.
DNS Servers	The IPv4 or IPv6 addresses of the DNS servers you plan to use. These should be the same DNS servers you use to resolve host names across your network. • Ensure that the DNS servers are reachable on the network before attempting installation. The installation will fail if the servers cannot be reached.
DNS Search Domain	The search domain you want to use with the DNS servers, for example, cisco.com. You can have only one search domain.

Important Notes

- Cisco Crosswork Infrastructure and applications are built to run as a distributed collection of containers managed by Kubernetes. The number of containers varies as applications are added or deleted.

- Dual stack configuration is not supported in Crosswork Platform Infrastructure. Therefore, **all** addresses for the environment must be either IPv4 or IPv6.

Install Cisco Optical Network Controller

Use the following steps to install Cisco Optical Network Controller:

Before you begin

- Cisco Crosswork Infrastructure 4.04.1 must be installed. See *Cisco Crosswork Infrastructure 4.0 and Applications Installation GuideCisco Crosswork Infrastructure 4.1 and Applications Installation Guide* for installation instructions.
- Verify that Crosswork Platform Infrastructure is green (healthy) and all the microservices are up and running.
- Ensure that conc.tar.gz file is downloaded from CCO to an external VM.

Procedure

Step 1 Log in to Cisco Crosswork Change Automation and Health Insights.

Step 2 Select **Administration** > **Crosswork Manager**.

Step 3 Navigate to **Application Management** tab and click **Applications** sub-menu.

Step 4 Click **Add File (.tar.gz)** button.

Step 5 Enter all the details:

- Server Path/Location: Location of the conc.tar.gz file
- Host Name/IP Address: IP address of the host
- Port: 22
- Username: username to access the external VM to which the `conc.tar.gz` file was downloaded
- Password: password to access the external VM to which the `conc.tar.gz` file was downloaded
- Select **Automatically clean all repository files before adding new one** button.

Click **Add**.

Step 6 The conc.tar.gz file is downloaded to Crosswork cluster.

Step 7 After the file is downloaded, navigate to **Application Management** tab and click **Applications** sub-menu. Select **Optical Network Controller** card and click the ellipsis (…) button.
The UI displays a new tab which shows you the build number of Optical Network Controller selected for install.

Step 8 Select **Install**.

Step 9 You can view the installation progress in the **Job History** sub-menu. **Job Details** section provides a detailed report of installation of Cisco Optical Network Controller.

Note

- To upgrade from Cisco Optical Network Controller 2.1 to Cisco Optical Network Controller 2.1.1, see Upgrade Cisco Crosswork.
- Cisco Optical Network Controller 2.1.1 update can be installed only on an existing Cisco Optical Network Controller 2.1 installation.

Log into Cisco Optical Network Controller

Use the following steps to log into Cisco Optical Network Controller:

Before you begin

To access Cisco Optical Network Controller, you must have permissions to access Cisco Crosswork Infrastructure. To add new users, see *Cisco Crosswork Infrastructure 4.0 and Applications Installation GuideCisco Crosswork Infrastructure 4.1 and Applications Installation Guide*.

Procedure

Step 1 In the browser URL field, enter **https://<Crosswork server IP Address: Port>/crosswork/onc/** .

Login page is displayed.

Step 2 Enter the username and password.

Step 3 Click **Sign In**.

Uninstall Cisco Optical Network Controller

Use the following steps to uninstall Cisco Optical Network Controller:

Procedure

Step 1 Log in to Cisco Crosswork Change Automation and Health Insights.

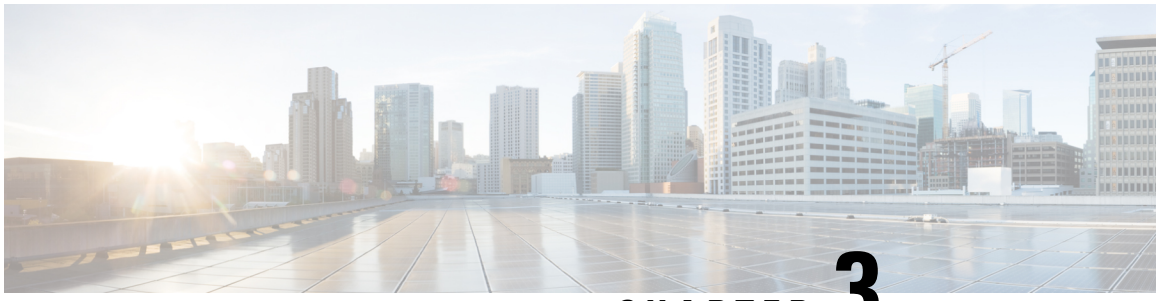
Step 2 Select **Administration** > **Crosswork Manager**.

Step 3 Navigate to **Application Management** tab and click **Applications** sub-menu.

Step 4 Select **Optical Network Controller** card and click the ellipsis (…) button.

Step 5 Select **Uninstall** from the menu.

Step 6 You can view the progress in the **Job History** sub-menu.



CHAPTER 3

Use Cisco Optical Network Controller

Table 2: Feature History

Feature	Release Information	Description
Network Periodic Full Sync Configuration	Cisco Optical Network Controller Release 1.1	You can now configure a periodic full sync for all the devices onboarded to Cisco Optical Network Controller.

This section contains the following topics:

- Onboard Devices and Discover Network, on page 9
- Configure Network Periodic Full Sync, on page 11
- Cisco Optical Network Controller TAPI Northbound Interface, on page 12

Onboard Devices and Discover Network

A device is added after a REST API call is issued to onboard the device. The Device Manager initiates data collection and this data is collected and translated into TAPI model which is eventually published to Hierarchical Controller.

For more information, see *Cisco Optical Network Controller TAPI Northbound Interface API Guide*.

You can onboard a device using Cisco Optical Network Controller GUI.

Onboard Devices to Cisco Optical Network Controller

Devices must be onboarded to Cisco Optical Network Controller to enable collection of device related information. Cisco Optical Network Controller supports Cisco NCS 2000 Shelf Virtualization Orchestrator (SVO) Series, Release 12.112.2 devices.

Manage Devices on Cisco Optical Network Controller

Use this task to add, edit, delete, or resync the devices onboarded to Cisco Optical Network Controller.

Before you begin

Log into Cisco Optical Network Controller, on page 8.

Procedure

Step 1 To add the devices, follow these steps:

a) Click **Devices** in the left panel.

b) Click **New**.

c) Enter the device details that are needed to connect to the device, such as Name, IP, Port, and Location.

Ensure that you enter valid a username and password of the device to enable Cisco Optical Network Controller to connect to the device.

d) Click **Save**.

The new device is onboarded and added to the **Devices** table. Cisco Optical Network Controller validates the connection with the onboarded device.

The **Name** column includes name, image, device connection status, and an icon indicating the connection status.

- Green—Device is connected.
- Yellow—Device is waiting to be connected.
- Red—Device is disconnected or a resync is needed or device deletion failed.
- Orange—Device deletion in progress.

For a disconnected device, click **Reconnect** option that is enabled for the device next to **Disconnected** status.

To trigger **Resync** for a particular device, select the device and click **Resync** or resync is triggered for all the devices during **Network Periodic Full Sync**. For more information, see Configure Network Periodic Full Sync, on page 11.

e) Repeat steps a through d to add additional devices.

Step 2 To import devices in bulk, follow these steps:

a) Click **Devices** in the left panel.

b) Click **Import Devices**.

c) Select the spreadsheet which has all the device details and click **Open**.

The new devices are onboarded and added to the **Devices** table. Onboarding of devices happen in batches of 100 devices at a time. After the first set of 100 devices are connected, the next 100 are processed.

Step 3 To edit a device, follow these steps:

a) Click **Devices** in the left panel.

b) Select the device that you want to edit and click **Edit** or click the device name under the **Name** column.

You can modify the username and password fields for the device.

Note
You cannot modify other details for a device.

Step 4 Resync a device to initiate collection of data. To resync, follow these steps:

a) Click **Devices** in the left panel.
b) Select the device that you want to resync and click **Resync**.

To resync multiple devices, select the devices and click **Resync**.

To resync all the devices, click **ResyncAll**.

To schedule a periodic resync of all the devices, see Configure Network Periodic Full Sync, on page 11.

Note
If a device is in **Disconnected** status, you can either **Reconnect** the device or **Resync** the device directly to recover the device connection.

Step 5 To reconnect a disconnected device, follow these steps:

a) Click **Devices** in the left panel.
b) For the disconnected device, click **Reconnect** option that is enabled for the device next to the **Disconnected** status or select the device and click **Reconnect** button from the top menu.

Step 6 To delete a device, follow these steps:

a) Click **Devices** in the left panel.
b) Select the device that you want to delete and click **Delete**.

Note
You cannot delete a device if collection is in progress.

Configure Network Periodic Full Sync

Use this task to schedule a periodic sync for all the devices that are onboarded to Cisco Optical Network Controller.

Before you begin

Log into Cisco Optical Network Controller, on page 8

Procedure

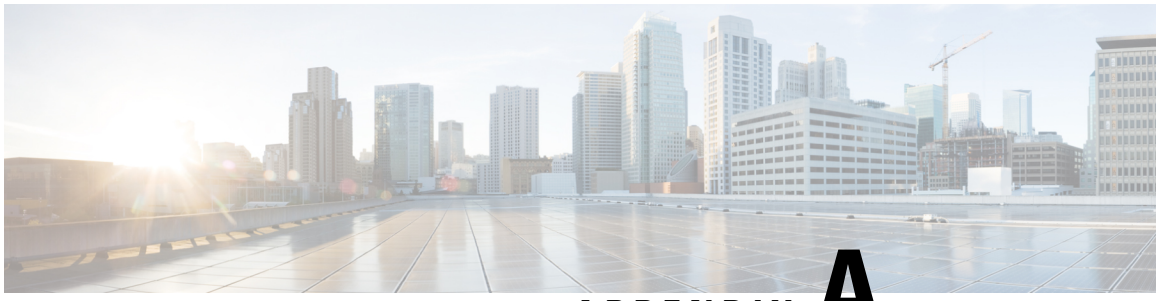
Step 1 Click **Configurations** in the left panel.
Step 2 In the **Periodic Network Full Sync** tab, click **Enable**.
Step 3 In the **Scheduled Start Time** field, enter the start time of full network sync in HH:MM:SS format in UTC.
Step 4 In the **Repeat Every** field, enter the interval rate in hours at which full network sync must run. Minimum value is 1 and maximum value is 23.
Step 5 Click **Apply**.

Note
To disable the periodic sync for the entire network, click **Disable** and click **Apply**.

Cisco Optical Network Controller TAPI Northbound Interface

Cisco Optical Network Controller exposes a standard T-API Northbound Interface (NBI) towards northbound clients. The TAPI NBI supports RESTCONF and NETCONF protocols. An SDN-C client such as Hierarchical Controller can communicate with Cisco Optical Network Controller TAPI NBI Server (SDN-C) using one these protocols and exchange TAPI model information.

For more information, see *Cisco Optical Network Controller TAPI Northbound Interface API Guide*.



APPENDIX A

Supported Components

Following is the list of supported components for Cisco Optical Network Controller:

Product ID	Description
Transponder/Muxponder	
NCS2K-400G-XP=	400G CFP2 MR xponder
Passives	
NCS2K-MF-6RU=	Mechanical frame for passive units - 14 slots with USB Hub - 6RU
NCS2K-MF10-6RU=	Mechanical frame for passive units - 10 slots with USB Hub - 6RU
NCS2K-MF-DEG-5=	Mesh interconnection MF unit - upto 5 degrees
NCS2K-MF-UPG-4=	Mesh interconnection MF unit - upgrade - 4 degrees
NCS2K-MF-DEG-5-CV=	5 degrees mesh interconnect - with Connection Verification
NCS2K-MF-UPG-4-CV=	4 degrees upgrade mesh interconnect - with Connection Verification
NCS2K-MF-MPO-16LC=	MPO-16 to 16xLC fan out MF unit - with integrated monitoring
NCS2K-MF-M16LC-CV=	MPO-16 to 16xLC fan out - with Connection Verification
NCS2K-MF-MPO-8LC=	MPO to 8x LC fan out MF unit - with integrated monitoring
NCS2K-MF-6AD-CFS=	6-port add/drop MF unit - Colorless Flex Spectrum
NCS2K-MF-10AD-CFS=	10-port add/drop MF unit - Colorless Flex Spectrum
NCS2K-MF-16AD-CFS=	16-port add/drop MF unit - Colorless Flex Spectrum

Product ID	Description
NCS1K-MD-64-C=	Optical module is based on Athermal Wave Guide (AWG) providing 64 channels at 75-GHz space covering the extended C-band of optical spectrum.
Optical Cables	
NCS2K-MF-2MPO-ADP=	Double MPO-16 to 2xMPO-8 Adapter MF unit - monitoring
Optical Amplifiers	
NCS2K-EDRA1-26C=	21 dBm Erbium Doped Raman Amplifier 26dB Span - C-Band, includes one 2m LC/LC fiber optic cables and one 2m E2000/PC high power fiber optical cable
NCS2K-EDRA1-35C=	21 dBm Erbium Doped Raman Amplifier 35dB Span - C-Band, includes one 2m LC/LC fiber optic cable and one 2m E2000/PC high power fiber optical cable
NCS2K-EDRA2-26C=	21 dBm Erbium Doped Raman Amplifier + Bst 26dB Span - C-Band, includes two 2m LC/LC fiber optic cables and one 2m E2000/PC high power fiber optical cable
NCS2K-EDRA2-35C=	21 dBm Erbium Doped Raman Amplifier + Bst 35dB Span - C-Band, includes two 2m LC/LC fiber optic cables and one 2m E2000/PC high power fiber optical cable
NCS2K-OPT-EDFA-35=	NCS2000 - Optical Amplifier, C Band, switchable gain
15454-OPT-AMP-C=	Enhanced optical amplifier, 20 dBm output power, can be configured as preamplifier or booster, C-band, 80 channel, 50-GHz compatible, LC connectors, midstage access, includes one 4-dB LC/LC attenuated loopback (to be used if DCU is not required) and two 2-meter LC/LC fiber-optic cables.
Line Cards	
NCS2K-9-SMR17FS=	9-port Single Module ROADM - 0-17dB Gain - Flex Spectrum
NCS2K-9-SMR24FS=	9-port Single Module ROADM - 12-24dB Gain - Flex Spectrum
NCS2K-9-SMR34FS=	9-port Single Module ROADM - 20-34dB Gain - Flex Spectrum
NCS2K-20-SMRFS-CV=	20-port SMR - Switch. Gain Flex Spectrum - Connection Verification

Product ID	Description
NCS2K-20-SMRFS-L=	20-port Single Module ROADM - Switchable Gain - Flex Spectrum
Contentionless Add/Drop Line Cards	
NCS2K-12-AD-CCOFS=	12-port - 4-degree - Contentionless add/drop unit (typical 20W, maximum 30W)
NCS2K-16-AD-CCOFS=	12-port - 4-degree - Contentionless add/drop unit (typical 40W, maximum 50W)
Patch Panels	
15216-MD-48-EVEN=	Cisco ONS 15216 exposed faceplate multiplexer/demultiplexer patch panels of 48-channels spaced at 100 GHz on the even ITU grid.
15216-MD-48-ODDE=	Cisco ONS 15216 exposed faceplate multiplexer/demultiplexer patch panels of 48-channels spaced at 100 GHz on the odd ITU grid.
Interleaver and Deinterleaver Pluggable	
15216-MD-48-CM=	50 GHz/100 GHz C-band interleaver and deinterleaver pluggable that provides signal interleaving and deinterleaving in 50-GHz channel spacing DWDM systems.
EDFA Amplifier Cards	
15454-OPT-EDFA-17=	Cisco True Variable Gain Booster Amplifier with maximum 17-dB gain
15454-OPT-EDFA-24=	Cisco True Variable Gain Booster Amplifier with maximum 24-dB gain
Raman Amplifier Cards	
15454-M-RAMAN-COP=	High-Power Co-Propagating, 1W optical pump output power, C-band, 96-channel 50-GHz Raman unit with 1 ES 2000 PS PC 2m cable
15454-M-RAMAN-CTP=	High-Power Counter-Propagating, 1W optical pump output power, C-band, 96-channel 50-GHz Raman unit with 2 ES 2000 PS PC – LC 2m cables

Supported Components