Manage Cable Devices

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The Cisco cBR-8 Converged Broadband Router (Cisco cBR-8) is a 13 rack unit (RU) chassis. It supports multiple card modules and is designed with back-to-back midplanes; a front facing Digital Midplane and a rear facing RF Midplane. In a cable network with the Remote PHY architecture, multiple Remote PHY Devices (RPDs) connect to Cisco cBR-8 devices based on the Data Over Cable Systems Interface Standard (DOCSIS) and EuroDOCSIS standards that define two-way operation over the cable network.

Remote PHY is an architectural strategy that removes the PHY element from a product and places that PHY element in a separate access point interconnected with an IP network. The Cisco Remote-PHY solution leverages existing IP technologies like Ethernet PON (EPON), Gigabit-capable Passive Optical Networks (GPON), and Metro Ethernet (MetroE) equipment; it deploys DOCSIS in Multi Dwelling Units (MDUs) over digital fiber to enable two-way services over cable.

Using Cisco EPN Manager, you can add and discover Cisco cBR-8 and devices and RPDs, view their L2TP links and topology on the network topology, and further configure them. You can also continuously monitor

the health of RPDs to Cisco cBR-8 device links. See Manage Cisco cBR-8 and RPDs Association, on page 9.

Cisco EPN Manager, enables you to create service definitions with profiles such as events profiles, downstream and upstream controller profiles, to associate the definitions with RPDs in bulk. As part of the service definition, you can also configure the Remote PHY timing values for the RPD, using the Remote DTI (R-DTI) protocol. To configure the R-DTI profile and other service definition parameters, see Manage RPD Service Definitions, on page 17.

For more information about cBR-8 devices, see http://www.cisco.com/c/en/us/td/docs/cable/cbr/cisco-cbr/index.html:

The process of managing cable devices in Cisco EPN Manager involves:

1. Ensuring that the cBR-8 devices and Cisco Smart PHY are up and available for configuring.

2. Configuring the required access in Cisco EPN Manager by providing Cisco Smart PHY credentials.

3. Adding the cBR-8 device and ensuring that the inventory collection status for the device is 'Completed'. See Add Devices to Cisco EPN Manager

4. Adding RPD information to Cisco EPN Manager either manually or by importing RPD details from a CSV file.

5. Ensuring that the status of CBR-8 and RPD pairing is Online.

6. (Optional) Creating service definitions or using the default service definition and applying them to the RPDs.

7. (Optional) Monitoring the devices using the network topology to view the alarm and link information.

8. (Optional) Managing device images using Software Image Management. See Manage Device Software Images.

Features and Limitations

Cisco EPN Manager supports the following features to manage cable devices:

- Importing RPD cBR-8 pairing details in bulk.

- Monitoring and visualizing RPD to cBR-8 L2TP links in the network topology.

- Ability to place unmapped cable devices on the network topology.

- Creating service definitions and associating them with RPDs.

- Managing software images on cBR-8 devices.

- Performing configuration audit using compliance for cBR-8 devices.

- Viewing cBR-8 device 360, interface 360, and RPD 360 information.

- Viewing cBR-8 device details in the chassis view.

- Viewing cable device syslogs.

- Service group configuration details and Fiber Node utilization dashboard.

- Viewing RPD Traps.

- Viewing part of network topology based on user defined geographical location, device location and radius.

- Viewing cable modem details under serving RPD and also with associated Fiber Node.

- LLDP based discovery of cable devices.

- Configuring Cisco Smart PHY with Cisco EPN Manager.

Cable Management Features and Supported User Groups

The following table lists the various cBR-8 and RPD management tasks supported by Cisco EPN Manager and the supported user groups. See View and Change the Tasks a Group Can Perform for information on the tasks that pertain to each user group and the default settings.

Table 1: Cable Management Features and Supported User Groups

Cable Management Features	Root/ Super Users	Admin Users	Config Managers	System Monitor	Monitor Lite	NBI Credentials	NBI Read	NBI Write	North-bound NBI	User Assistant	Other Users
Adding, editing, deleting, importing, and clearing RPDs. Editing RPD data using the inline editing option.	Yes	Yes	Yes	–	–	–	–	Yes (not applicable for inline editing of RPD data and for clearing RPDs)	–	–	–
Launching the Cable RPD Association page and the Cable Service Definitions page	Yes	Yes	Yes	Yes	Yes	–	–	–	–	Yes	–
Listing RPDs	Yes	Yes	Yes	Yes	Yes	–	Yes	–	–	–	–
Exporting RPDs	Yes	Yes	Yes	Yes	Yes	–	Yes	Yes	–	–	–
RPD 360 and Interface 360	Yes	Yes	Yes	Yes	Yes (not applicable for Interface 360)	–	Yes	–	–	–	–
Jobs menu	Yes	Yes	Yes	–	–	–	Yes	Yes	–	–	–

Cable Management Features	Root/ Super Users	Admin Users	Config Managers	System Monitor	Monitor Lite	NBI Credentials	NBI Read	NBI Write	North-bound NBI	User Assistant	Other Users
Launch from Options menu (geo map location, assign/manage service definitions, global settings, network topology)	Yes	Yes	Yes	–	–	–	Yes	–	–	–	–
Launch Geo Map (RPD Association page, Manage Service Definition page from Geo Map)	Yes	Yes	Yes	–	–	–	–	–	–	–	–
Viewing cable devices in the network topology	Yes	Yes	Yes	Yes	-	–	Yes	–	–	–	–
Launching, viewing, adding, and editing Cable Application (Cisco Smart PHY) client credentials. Setting in read only mode.	Yes	Yes	–	–	–	–	– (Only viewing details is permitted)	Yes (only to edit/save the Smart PHY credentials and for setting in read only mode)	–	–	–

Cable Management Features	Root/ Super Users	Admin Users	Config Managers	System Monitor	Monitor Lite	NBI Credentials	NBI Read	NBI Write	North-bound NBI	User Assistant	Other Users
Viewing Cisco cBR-8 device information (in the Configuration tab) such as the device's license usage status, available sensor readings, IPv4 and IPv6 statistics, voice calls count, fan and power supply status, and other generic data. Also view slot level information such as FPGA/CPLD version numbers.	Yes	–	Yes	–	–	–	Yes	–	–	–	–
View Cisco cBR-8 device performance information (in the Performance tab) in the linecard upstream and downstream dashlet, power supply dashlet, CPU and memory utilization dashlet, fan tray dashlet, along with other general configuration details.	Yes	–	Yes	Yes	–	–	Yes	–	–	–	–
Listing Service Definitions	Yes	Yes	Yes	Yes	Yes	–	Yes	–	–	–	–

Cable Management Features	Root/ Super Users	Admin Users	Config Managers	System Monitor	Monitor Lite	NBI Credentials	NBI Read	NBI Write	North-bound NBI	User Assistant	Other Users
Creating, copying and deleting service definitions. Updating and assigning service definitions to RPDs. RPD assign (up arrow link).	Yes	Yes	Yes	–	–	–	–	Yes	–	–	–
Export service definition list	Yes	Yes	Yes	Yes	Yes	–	Yes	–	–	–	–
Cable Dashboard settings (launch cBR-8 dashboard, access software version, license usage and status, cable modem, RPD status, FPGA version, alarm dashboard, cable modem, flap count, count by vendor, categories, and classification	Yes	Yes	Yes	Yes	–	–	Yes	–	–	–	–
Launching Smart PHY Global Settings	Yes	Yes	Yes	Yes	Yes	–	Yes	–	–	–	–
Smart PHY Global Settings (RPD Global configuration, software compatibility)	Yes	Yes	Yes	–	–	–	–	Yes	–	–	–
Utilization tab (launching, configure thresholds, DS/US Channel popover, RPD/Modem/OFDM popover, exporting table)	Yes	Yes	Yes	Yes (except for configuring thresholds (CRUD))	–	–	Yes	– (except for configuring thresholds (CRUD))	–	–	–

Cable Management Features	Root/ Super Users	Admin Users	Config Managers	System Monitor	Monitor Lite	NBI Credentials	NBI Read	NBI Write	North-bound NBI	User Assistant	Other Users
Controller profile (launching and read view of table content)	Yes	Yes	Yes	Yes	–	–	Yes	–	–	–	–
Flap details (launching and read view of table content)	Yes	Yes	Yes	Yes	–	–	Yes	–	–	–	–

Configure Client Credentials for Cable Devices

To manage Cisco cBR-8 devices and Cisco Remote-PHY devices (RPDs), you must first configure the Cisco Smart PHY client credentials. This enables Cisco EPN Manager to set up a connection with the Cisco Smart PHY application.

To configure Cisco Smart PHY credentials:

Before you begin

Ensure that you log in with the required credentials for configuring the Cisco Smart PHY client credentials. For information on the user groups and supported tasks, see Cable Management Features and Supported User Groups, on page 3.

For more information about Cisco Smart PHY, see https://www.cisco.com/c/en/us/td/docs/cable/cbr/administration/guide/cisco_smart_phy_application_user_guide/information_about_cisco_sdn_application.html.

Note The Cisco Smart PHY application must not be configured with more than one Cisco EPN Manager server. If the Smart PHY credentials have to be updated, it is recommended that the RPDs are removed from Cisco EPN Manager before configuring the credentials in the Admin Settings page.

Step 1 From the left sidebar, choose **Administration** > **Settings** > **System Settings**.

Step 2 Click **Client and User** and select **Cisco Smart PHY Credentials**.

Step 3 Specify the following Cable Application credentials:

a) IP Address or DNS name—The IPv4 address of the client or the DNS hostname of the Cisco Smart PHY application.

b) Port—Numeric port number for communication between the device and Cisco EPN Manager.

c) User name and password—Specify the login credentials to login to the client. You will need to re-enter the password for verification.

Note You can integrate Smart PHY with Cisco EPN Manager in read-only mode by selecting the **Enable Read Only Mode** checkbox. In read-only mode, Cisco EPN Manager will not add cBR-8s to Smart PHY's inventory and you will not be able to provision or modify the configuration of an RPD. By default, this check box is disabled. Only Root, Admin, and Super Users can enable this check box. Other users do not have privilege for the same but can view the state of this button.

Step 4 Click **Save** to enable the client credentials.

You can now add CBR-8 to RPD pairing information and associate RPDs with cable service definitions. See Assign Service Definitions to RPD, on page 18.

Step 5 Click **Delete** to remove an existing Smart PHY credential information from the Cisco EPN Manager database.

Add a New Vendor OUI Mapping

Cisco EPN Manager relies on the IEEE Organizational Unique Identifier (OUI) database to identify the client vendor name mapping. The User Defined OUI List page displays a list of vendor OUI mappings that user has created. When an OUI is added, Cisco EPN Manager verifies to see if the OUI exists in the IEEE database. If the OUI exists, Cisco EPN Manager updates the vendor name for the OUI. If the OUI does not exist, a new OUI entry is added to the vendor OUI mapping.

To add a new vendor OUI mapping:

Step 1 Go to **Administration** > **System Settings**.

Step 2 From the left sidebar menu, click **Client and User** and select **User Defined OUI**. The User Defined OUI page is displayed.

Step 3 From the drop-down list on the right hand side, choose **Add OUI Entries**, and click **Go**.

Step 4 In the OUI field, enter a valid OUI.

Step 5 Click **Check** to verify if the OUI exists in the vendor OUI mapping.

Step 6 In the Name field, enter the display name of the vendor for the OUI.

Step 7 Select the **Change Vendor Name** check box to update the display name of the vendor, if the OUI exists in the vendor OUI mapping.

Step 8 Click **OK**.

Upload an Updated Vendor OUI Mapping File

To upload the updated vendor OUI mapping file:

Step 1 Go to **Administration** > **System Settings**.

Step 2 From left sidebar menu, select **Client and User** and click **Upload OUI**.

Step 3 Choose **Update online from IEEE** option. This will download the latest OUI mapping file.

Step 4 Click **OK**.

Add Cable Devices

Add the required cBR-8 devices to Cisco EPN Manager by device discovery, manual addition, or by importing device details using a CSV file. For more information about adding devices, see Add Devices to Cisco EPN Manager.

After you add devices, and before you configure cable devices, you must first ensure that the inventory collection status for the devices is **Completed**. You can then proceed with adding RPDs and associating them with the cable devices. See .

Manage Cisco cBR-8 and RPDs Association

You can use Cisco EPN Manager to monitor and discover RPDs from Cisco cBR-8 devices. Once the devices are discovered, the pairing between the devices must be established as explained in the sections below.

Launch the Cable RPD Association page in one of the following ways:

• From the **Configuration** > **Cable** > **RPD Association** option in the left navigation panel.

• From the **Cable** drop-down menu in the network topology.

RPD Auto Discovery: As part of the Cisco cBR-8 device discovery, RPDs associated with the devices are automatically added to the Cisco EPN Manager database. In this scenario, you do not need to add or import the RPDs as shown below, however, the RPD will be visible in the **RPD Association** page with only minimal information.

Note Only RPDs with Principal Role will be automatically discovered.

Manage cBR-8 devices and RPDs in the following ways:

Manage cBR-8 to RPD Pairing	Description
Add CBR-8 to RPDs pairing information manually	Add cBR-8 and RPDs Pairing Information Manually, on page 11
Import CBR-8 to RPDs pairing information using a CSV file	Import cBR-8 and RPDs Pairing Information in Bulk, on page 12

Delete RPDs	1. From the left sidebar, choose **Configuration** > **Cable** > **RPD Association**.
	2. Select the RPDs you want to delete, and click the 'Delete' icon from the toolbar. Deleting RPDs will delete the associated links with Cisco cBR-8 devices and thus update the Cisco cBR-8 RPD links view in network topology.
	Note Once you delete a Cisco cBR-8 device, the RPDs associated with those devices are also deleted from Cisco EPN Manager.
	Bulk delete operations can be monitored using the Jobs feature. For more information, see RPD Job Status Summary, on page 12.
Edit RPD	1. From the left sidebar, choose **Configuration** > **Cable** > **RPD Association**.
	2. Select the RPD you want to edit, and click the 'Edit' icon from the toolbar.
	3. Make the required changes to the parameters. For more information about these parameters, see RPD Parameters and Descriptions, on page 13.
	4. Click **Save** to update your changes. You can check the Service Status icon again to see the updated status.
	Note The RPD name may fail in Cisco EPN Manager if the RPD to be edited does not exist in Smart PHY. For more information, see Troubleshooting Cable Devices, on page 29.
Apply service definitions to RPD(s)	Assign Service Definitions to RPD, on page 18

Add cBR-8 and RPDs Pairing Information

Before you can manage Cisco cBR-8 devices and RPDs, you need to first discover the cBR-8 - RPDs pairing information to Cisco EPN Manager from the Cisco cBR-8 devices.

When Cisco cBR-8 devices are in sync with Cisco EPN Manager with a pending integration with the Cisco Smart PHY, the auto discovered service definitions (associated with RPDs) cannot be edited. Once the integration with the Cisco Smart PHY is complete, the service definitions that are marked as 'None' are auto assigned to the default service definition.

Link Utilization: After the pairing of the devices has been established, you can view the topology of the cable network in the network topology and monitor the health of the links between the devices. To do this:

1. Choose **Maps** > **Topology Maps** > **Network Topology**.

2. Use the **Cable** drop-down menu to filter Cable devices. By default, the physical links between the Cisco cBR-devices and the RPDs are displayed.

3. Use the **Show** option and choose **Links** to filter Physical or L2TP links.

   For cable L2TP links, L2TP utilization (for available L2TP tunnels) is calculated per RPD by getting the OFDM channels utilization of the associated downstream controller. For more information, see, Show Bandwidth Utilization for Links on the Map.

Pre-requisites:

- Add cBR-8 devices to Cisco EPN Manager. See Add Devices to Cisco EPN Manager.

- Ensure that the inventory collection status for the cBR-8 device (associated with the RPDs you are importing) is 'Completed'.

- Ensure that you configure the Cisco Smart PHY client credentials. See Configure Client Credentials for Cable Devices, on page 7.

Add cBR-8 and RPDs Pairing Information Manually

To import cBR-8 and RPDs pairing information manually:

Step 1 From the left sidebar, choose **Configuration** > **Cable** > **RPD Association**.

Step 2 Click the + (Add) icon.

Step 3 Enter the RPDs parameters as described in RPD Parameters and Descriptions, on page 13 and click **Save**.

Note RPDs with only Name or MAC ID can also be added.

Step 4 To verify that the entered RPDs information is accurate:

a) Hover over the Service Status icon for each RPD to understand the status of the pairing between the cBR-8 device and the RDP. To understand what each service state means, see Monitor the Health of RPD to cBR-8 Links, on page 23.

b) To modify the parameters, click on the respective parameters and make the required changes.

c) Click **Save** again to update your changes. You can then check the Service Status icon again to see the updated status.

Step 5 Click **Clear** to clear the association of CCAP Core and CCAP Core Interface for the selected RPDs.

Step 6 (Optional) Click the *i* (**information**) icon from the **RPD MAC ID** column to launch the RPD 360 view for the selected RPD. For more information, see RPD 360 view, on page 16

Note • RPDs should have MAC ID, Name, and configured Smart PHY settings to launch the RPD 360 view.

• RPD 360 view is not available for auto-discovered RPDs with service definition name as UNKNOWN.

Step 7 (Optional) In **RPD Association** page, click the **Options** drop down menu and select the following shortcuts to launch the relevant pages:

a) Click **Apply Geo Map Location Filter** to launch the Geographical Location Filter. For more information, see Filter RPDs by Geographical Location, on page 14.

b) Click **Assign Service Definition** to assign service definitions to selected RPD(s). For more information, see Assign Service Definitions to RPD, on page 18.

c) Click **Manage Service Definition** to view and modify the service definitions. For more information, see Manage RPD Service Definitions, on page 17

d) Click **Go to Global Settings** to view and modify the Smart PHY Global settings. For more information, see Smart PHY Global Settings, on page 15

e) Click **View Network Topology** to launch the topology view of the RPD.

Import cBR-8 and RPDs Pairing Information in Bulk

Cisco EPN Manager compares your entries with the current database to check for duplicate entries. If your entries are duplicate, the parameters that match are highlighted and you can choose to replace the existing entries one by one, in bulk, or skip the import operation altogether.

To import cBR-8 and RPDs pairing information using a CSV file:

Step 1   From the left sidebar, choose **Configuration** > **Cable** > **RPD Association**.

Step 2   Click the 'Import' icon.

Step 3   Use the template supported by Cisco EPN Manager for importing RPD information by following these steps:

    a) Click the **Download the 'Associate RPDs' template (*.csv)** hyperlink to download a sample template for importing cBR-8 and RPDs pairing information in bulk.

    b) Choose a location on your system where the file must be saved, and click **OK**.

Step 4   To import the cBR-8 and RPDs pairing information:

    a) Ensure that the CSV file you are using to import is of the same template as the CSV file downloaded in Step 3 above.

        Note   RPD Name and MAC ID must be specified in the CSV file before you import.

    b) Click the 'Import' icon.

    c) Click **Browse** and locate the CSV file that you want to import.

    d) Click **Import**.

        Note   You can also import the CSV file exported from Smart PHY application, by following the above step.

Step 5   To view status of bulk operations (Import/Export/Delete), click the **Jobs** button. For more information, see RPD Job Status Summary, on page 12.

Step 6   (Optional) Verify that the RPDs information imported is accurate:

    a) Hover over the Status icon for each RPD to understand the status of the pairing between the cBR-8 device and the RPD. To understand what each service state means, see Monitor the Health of RPD to cBR-8 Links, on page 23.

    b) To modify the parameters, click on the respective parameters and make the changes. For more information about the RPDs parameters, see RPD Parameters and Descriptions, on page 13.

    c) Click **Save** to update your changes. You can then check the Service Status icon again to see the updated status.

RPD Job Status Summary

In a typical large network, there are several thousands of RPDs that get deployed to the system. The status of these bulk operations (bulk import/export/delete) can be monitored using the Jobs feature, that will display the list of jobs in the last 24 hours and their operational status.

In the RPD Association page, click the **Jobs** button and the **Job Status Summary** window is displayed. For every job status change, notifications are displayed on the job button (within 2 minutes). For more information about a successful/failed operation, click on **View Details**.

Note   The RPD Association page needs to be manually refreshed after every bulk import/delete operation to reflect the change.

The Jobs Status Summary window provides color-coded notifications to differentiate the status of the job:

Table 2: Job Status Summary

Icon color	Status
	Job scheduled/ in progress
	Job successful
	Job failed

RPD Parameters and Descriptions

RPD Parameters	Description
ID	ID of the RPD. By default, this column is hidden. To view this column, click ⚙ at the top right corner of the table, choose **Columns**, and then select **ID**.
Timestamp	Timestamp when the RPDs are created, imported, or edited. By default, this column is hidden. To view this column, click ⚙ at the top right corner of the table, choose **Columns**, and then select **Timestamp**.
Status	Status of the RPD.
RPD Name	Hostname of the RPD device.
RPD MAC ID	MAC ID of the RPD.
Service Definition	Cisco EPN Manager cable service definition applied to the RPD. When the Cisco Smart PHY client is not configured, this field is marked as 'Unknown'. This is applicable for auto-discovered RPDs.
CCAP Core	The Cisco cBR-8 device that the selected RPD should connect to.
CCAP Core Interface	Interface of the cBR-8 device that is physically connected to the RPD.
Downstream Data Service Group	All RPDs with the same data service group will share the Downstream controller for Data Service (Virtual Splitting for Data).
Upstream Data Service Group	All RPDs with the same data service group will share the Upstream controller for Data Service (Virtual Splitting for Data).
Data Primary RPD US Port	Value of this column can be 0, 1 or empty (no value). The value of this column must be same as the OOB Primary RPD US Port column.
Video Interfaces	Complete name of the TenGigabitEthernet DPIC Interface to be used for Narrowcast/Broadcast Video Service.

RPD Parameters	Description
Video Service Groups	All RPDs with the same video service group will share the Narrowcast/Broadcast controller for Video Service.
Out of Band Interface	Complete name of the TenGigabitEthernet DPIC Interface to be used for Out of Band Interface.
OOB Primary RPD US Port	Value of this column can be 0, 1 or empty (no value). The value of this column must be same as the Date Primary RPD US Port column.
Additional Cores	List of additional cores the RPD should connect to
Cable DSG TGs	Advanced-Mode DOCSIS Set-Top Gateway (A-DSG) tunnels associated to one or more downstream interfaces.
RPD Latitude	Represents the location coordinate of the RPD.
RPD Longitude	Represents the location coordinate of the RPD.
Pre Configure	This column is read-only, and is always set to **true** to ensure that the Cisco Smart PHY application validates a preconfiguration that is available on the Cisco cBR-8 router and applies the configuration immediately. This process saves the time in bringing the RPD online.
RPD Description	Description of the RPD device.
Information (i) icon	The information (i) icon allows you to launch the 360 view (RPD 360, Device 360, and Interface 360) for the selected Cisco cBR-8 device and its associated interfaces. For more information, see, Get Basic Device Information: Device 360 View.

Filter RPDs by Geographical Location

Large volumes of RPDs can be efficiently handled by filtering them using their geographical location.

To use the geo filter:

Step 1 In the **RPD Association** page (**Configuration** > **Cable** > **RPD Association**), click on **Options** and select **Apply Geo Map Location Filter**. The geo filter settings from Topology page is displayed.

Step 2 Click the **Apply to this page** checkbox to apply the filter to the list of RPDs in the RPD Association page. A message "Location Filter Applied" is displayed to notify about the filter operation. If the checkbox is unchecked, the filter is removed and the entire RPD list is displayed.

Step 3 To edit or enable the geo filter (if the geo filter is disabled), click on **Edit Filter on Geo Map**. The navigation moves to the Network Topology page. For more information, see Location Filter in the Geo Map.

Step 4 (Optional) After editing/enabling the geo map filter in Network Topology page, click on **Cable** > **Associate RPDs** to navigate to the **RPD Association** page.

Smart PHY Global Settings

Cisco EPN Manager allows you to view and manage the Smart PHY Global settings.

Launch the Smart PHY Global Settings page in one of the following ways:

- From the **Configuration** > **Cable** > **Smart PHY Global Settings** option in the left navigation panel.
- In **RPD Association** page, click on **Options** > **Go to Global Settings**.
- In **Network Topology** page, click on **Cable** > **Go to Global Settings**.

RPD Global Configuration

Cisco EPN Manager allows you to view and manage the RPD Global Configuration.

Step 1 In the **Smart PHY Global Settings** page, choose the following parameters according to your requirement:

a) **Configure Static Route**: Cisco Smart PHY application option adds a static route configuration on the cBR-8 device for IPv4/IPv6 network interfaces configured on the DPIC.

b) **Validate Software Compatibility**: Cisco Smart PHY application checks the compatibility between the RPD version and the Cisco cBR-8 device version specified in the table.

c) **Persist Running Configuration**: Cisco Smart PHY application makes the configuration persistent for every change made on the Cisco cBR-8 device.

The **Save Interval** option is enabled when Persist Running Configuration is enabled. The value can be a unique integer ranging from 10 to 10800.

Step 2 Click **Save** to update your changes.

Software Compatibility

Smart PHY Global Settings allows you to add, edit, or delete the software compatibility matrix. Fields that are not marked as optional are mandatory.

The Software Compatibility window displays a compatibility matrix for the RPD software versions and the Cisco cBR software versions. The Smart PHY application detects the software incompatibility between an RPD and a Cisco cBR-8 router, and alerts you about the incompatibility. After the alert appears, you can either manually upgrade the RPD software version or upgrade it through the Smart PHY application.

Table 3: Software Compatibility Matrix field description

Field Name	Description
RPD Vendor	Name of the RPD Vendor.
RPD Software Version	Software version running on the RPD.
Router Vendor	Router Product type from the inventory.

Field Name	Description
Router Software Version	Software version of the router.

RPD 360 view

The RPD 360 view is a pop-up window that provides quick information about the RPD, its inventory, and its status. This includes service groups, sessions, history, modem list, and events information.

Launch the RPD 360 view in one of the following ways:

- In **RPD Association** page, click the *i* icon in the **RPD MAC ID** column.

- In the **Cable Dashboard** page (**Dashboard** > **Cable** > **cBR-8 Dashboard**), select the 'RPD chart' to view the device list. Click the *i* icon in the **RPD IP Address** column.

- In the **Network Topology** page (**Maps** > **Network Topology**), select any RPD and click the **View 360** option.

- In the **Utilization** page, open the **RPD Count** window and click the *i* icon in the **RPD Name** field.

The RPD 360 view provides general device and performance information at the top of the view, and more detailed interface information in tabs in the lower part of the view.

Table 4: RPD 360 view information

Information provided in RPD 360 view	Description
General information	Attributes such as: • RPD Name • RPD Status (conveyed by the icon) • Description • MAC Address • IP Address • Associated cBR-8 • Interface • Service Definition • Lat. | Long. • Serial Number • Product Type • Vendor • Software **Note** 'None' will be displayed for attributes without any value.

Information provided in RPD 360 view	Description
Service Groups tab	Channel interface and the relevant service group information. **Note** 'Data not configured' is displayed if there are no values to display.
Sessions tab	Available DEPI sessions for the selected RPD.
History tab	Status history of the selected RPD.
Modems tab	List of modems serving under the selected RPD.
Events tab	Lists the RPD events. If RPD events appear with the same event ID and severity level, RPD 360 will show an aggregated count with timestamp of the latest event.

Note   If 'No data available' is displayed for all the tabs (except the Modems tab), then the RPD is not available in Smart PHY.

Manage RPD Service Definitions

Cisco EPN Manager cable service definitions enable you to associate event and data service profile related information directly with one or multiple RPDs in bulk.

Launch the Service Definitions page in the following ways:

- Go to **Configuration** > **Cable** > **Service Definitions**

- In the **RPD Association** page, click **Options** and select **Manage Service Definition**.

- In the **Network Topology** page, click **Cable** drop-down menu and select **Manage Service Definition**.

You can manage cable service definitions in the following ways:

Manage Cable Service Definitions	Description
Create and edit cable service definitions	See Create and Edit Cable Service Definitions, on page 18.
Copy service definitions	1. From the left sidebar, choose **Configuration** > **Cable** > **Service Definitions**. 2. Select the Service Definitions you want to copy, and click **Save Copy**. The parameters of the selected service definition are populated onto a new service definition. You can modify the parameters, if required, and then save. Ensure that the names of the service definitions are unique.

Manage Cable Service Definitions	Description
Delete cable service definitions	1. From the left sidebar, choose **Configuration** > **Cable** > **Service Definitions**. 2. Select the Service Definitions you want to delete, and click **Delete**. **Note** You cannot delete default service definitions and the service definitions assigned to RPD(s). To delete a service definition, you must reassign the associated RPD(s) and assign a different service defintion as the default before you can delete it.
Set a new cable service definition as the default	1. From the left sidebar, choose **Configuration** > **Cable** > **Service Definitions**. 2. Select the Service Definitions that must be set as the default. 3. Enable the **Set as Default** checkbox. 4. Click **Update and Assign**. **Note** When you import RPD information using a CSV file and leave the Service Definition field blank, the default service definition is automatically associated with the RPD(s).

Create and Edit Cable Service Definitions

To create cable service definitions:

Step 1 From the left sidebar, choose **Configuration** > **Cable** > **Service Definitions**.

Step 2 Click + **Create New** from the navigation panel on the left.

Step 3 Specify the service definition parameters as described in Cable Service Definition Parameters and Descriptions, on page 19.

Step 4 Click **Save** to save the definition or **Save and Assign** to assign the new definition to RPD(s) immediately. You can also further assign saved definitions to RPDs as described in Assign Service Definitions to RPD, on page 18.

Assign Service Definitions to RPD

Assign service definition to RPD(s) in the following ways:

- Using the Cisco EPN Manager GUI to select the service definition that must be assigned to the RPD(s).

- Importing RPD information using a CSV file that specifies the names of the service definitions associated with the MAC ID of the RPD(s).

To assign cable service definition to RPD(s):

Before you begin

- Add cBR-8 devices to Cisco EPN Manager and ensure that the inventory collection status for the devices is 'Completed'. See Add Devices to Cisco EPN Manager.

Step 1 From the left sidebar, choose **Configuration** > **Cable** > **RPD Association**.

Step 2 To select service definition and then apply them to RPD(s):

a) Click **Options** and select the **Assign Service Definition**.

b) Select the required Service Definition from the panel on the left and then select the required RPD(s) from the Cable Associate RPD(s) table.

c) Click **Assign**.

Step 3 To import service definition (associated with RPD) using a CSV file:

a) Follow the steps described in Import cBR-8 and RPDs Pairing Information in Bulk, on page 12.

b) Ensure that the Service definition field in the CSV file accurately represents the exact name of the service definition associated with the RPD(s).

Step 4 (Optional) To verify, check the numeric value displayed alongside the service definition. This number represents the total number of RPD(s) to which the service definition is assigned.

Cable Service Definition Parameters and Descriptions

The table below describes the parameters and values used in cable service definitions.

Cable Service Definition Parameters	Description
Name	Name of the service definition. This name can be used to associate RPD(s) to service definitions automatically while importing RPD data into Cisco EPN Manager.
Description (Optional)	A description that explains the purpose of the service profile.
Event Profile	Specifies the event parameter for RPD(s) associated with this service definition. Range from 0 to 63.
R-DTI Profile	Remote DOCSIS Timing Interface (R-DTI) Set. Defines the RFC 1588 clock profile parameters for the RPD. Range from 1 to 64.
Pilot Tone Profile	Specifies Pilot Tone Profile parameter for RPD(s). Range from 0 to 511.
Cable DSG TGs	Range from 1 to 65535, seperated by semicolon (;).
Primary Service Parameters	
Service Group Profile	Defines the channels and bonding parameters for the RPD(s) associated with this service definition.

Cable Service Definition Parameters	Description
Downstream Controller Profile	Specified the RF parameter for Downstream Data Channel(s). Range from 0 to 255.
Upstream Controller Profile	Specified the RF parameter for Upstream Data Channel(s). Range from 0 to 511.
Enable MAC Domain Splitting	Enables the segregation of Upstream and Downstream data channels, used for multicast traffic.
Video Service Parameters (Optional)	
Narrowcast Video Controller Profile	Specifies RF parameters for Narrowcast (Downstream Video Controller Profile) data channels. Range from 0 to 255.
Broadcast Video Controller Profile	Specifies the RF parameters for Broadcast (Downstream Video Controller Profile) data channels. Range from 0 to 255.
Out Of Band Parameters (Optional) **Note** You must choose to fill either all of the Out of Band parameter fields, or none at all.	
Downstream VOM ID	ID required to configure the RPD to use OOB. This value specifies the RF parameters for out of band downstream VOM channels. Range from 0 to 10.
Downstream and Upstream Profile IDs	Specifies the RF parameters for out of band downstream/upstream profile channels. Range from 0 to 511.
Upstream VARPD ID	Specifies the RF parameters for out of band upstream VARPD channels. Range from 1 to 32.

View and Export Cable Device Information and Configuration Details

Using the Cisco EPN Manager Chassis View, you can view Cisco cBR-8 device information such as the device's license usage status, sensor readings, IPv4 and IPv6 statistics, bandwidth utilization on the different channels and controllers, fan and power supply status, and more. You can also view slot level information such as FPGA/CPLD version numbers.

To view device and chassis information described in the table below:

Before you begin

To ensure that information is collected and reported for the Cisco cBR-8 routers in your network, verify that Cable Policies is listed on the **Monitoring Policies** page (**Monitor > Monitoring Tools > Monitoring Policies > Policies** pane), is currently active, and has polling intervals set for its parameters. To activate Cable monitoring policies, see, Change Thresholds and Alarm Behavior for a Monitoring Policy.

| **Note** | For more information on cable policies, see Cable Policy and Cable Utilization |

Step 1 From the left sidebar, choose **Configuration** > **Network Devices**.

Step 2 To view device or chassis information, click the device/chassis/supervisor (SUP) from the Chassis Explorer.

Step 3 To view the fan or power supply information, click fan or power supply module from the Chassis Explorer.

Step 4 Click the **Configuration** tab.

Step 5 Expand the tabs listed in the table below to view the corresponding information.

For a graphical representation of this info, navigate to the **Performance** tab and ensure that you add the required dashlet to the tab. You can display up to 10 dashlets at a given point of time on the Performance tab.

To filter mac domains, fiber nodes, or controllers based on the utilized bandwidth values or the stream types, use the **Advanced Filter** option in the **Configuration** tab. For example, you can filter mac domains that have average utilization values greater or lesser than a particular range. You can further add additional filters to list mac domains with a particular stream type (such as downstream or upstream).

Table 5: Cable Device Configuration Information

Tabs	Chassis Explorer Selection	Requires Policy Activation	Information Available
General	Device, chassis, line cards, SUP, fan, and power supply unit.	No	• Generic device and chassis information: View information such as, device name, IP address, installed software version, system up time, device serial number, product ID, part number, device operational state (whether enabled or not), hardware version number, associated CLEI code, operating or configured redundancy state, the unique description associated with the device, number of ports that are up/down, and the device's current ICMP latency. • Fan information: Fan usage status in percentage format. • Power Supply information: Total power capacity and power consumed by the device in watts. • Line card information: View generic device information and the upstream and downstream bandwidth utilization of the card. • Voice Calls information: View the count of active high priority calls and all active calls. The count is refreshed periodically based on your settings in the Cable Monitoring policy settings. • License State information: View license state information such as Registration status, Authorization, UDI and Serial Number.
License Usage Status	Device	No	Licenses usage information and reporting of the Cisco products on the Cisco cBR-8 device, along with the enforced state.

Tabs	Chassis Explorer Selection	Requires Policy Activation	Information Available
Sensor Readings	Line cards, fans, and power supply units.	Yes	General environmental status of each FRU since installation. You can view the name, sensor state, and threshold values. The sensor readings include the temperature conditions.
FPGA/CPLD Versions	SUPs	No	All available Supervisor FPGA or CPLD firmware on the router and their respective version numbers.
IPv4 and IPv6 Statistics	Device	Yes	Type of packets and number of packets being sent and received. This includes IPv4 ARP statistics, and IPv6 neighbor statistics.
Modem Details	Device	Yes	View the number of cable modems using different DOCSIS versions (such as DOCSIS 2.0 and DOCSIS 3.1) and belonging to different vendors.
DEPI Sessions	Device	No	DEPI (Downstream External-PHY Interface) is an IP Tunnel that exists between the CCAP Core and the Remote PHY using Layer 2 Tunneling Protocol (L2TP). Using this tab, you can view the number of DEPI sessions for every RPD connected with the selected Cisco cBR-8 device. You can also view additional information about the remote device such as the associated tunnel IDs, L2TP class, device name, IP address, and state. For detailed information about each DEPI session, navigate to the Network Topology, identify the RPD, and use the RPD 360 view for detailed information such as the DEPI session modes, remote states, associated pseudowires, etc.
Fiber Node Utilization	Device	Yes	View the list of fiber nodes on the selected device, their streaming modes (upstream or downstream), and the average utilization of each fiber node (average of all channels associated with the fiber node). For a graphical representation of the percentage range of utilization mapped to the number of fiber nodes per range, view the Fiber Node Downstream/Upstream Utilization graph in the Performance tab.
Mac Domain Utilization	Device	Yes	View the list of MAC Domains available on the selected device, their streaming modes (upstream or downstream), and the average utilization values per Mac domain node (average of all channels associated with every Mac domain). For a graphical representation of the percentage range of utilization mapped to the number of mac domains per range, view the MD Downstream/Upstream SG Utilization graph in the Performance tab. **Note** The recommended polling interval is 1 hour.

Tabs	Chassis Explorer Selection	Requires Policy Activation	Information Available
Cable Controller Utilization	Line Card	Yes	View the configured controller types on the selected card, their streaming modes (upstream or downstream), and the average utilization of each controller (average of the bandwidth utilized on all channels associated with the controller).

Monitor the Health of RPD to cBR-8 Links

The link between cBR-8 device and its associated RPD(s) is represented with the link type L2TP in Cisco EPN Manager. To view the links in the network topology and display the associated link 360 details, see Get More Information About Links.

The table below explains the link states once cBR-8 RPD(s) association details are added to the Cisco EPN Manager:

Icon	Status	Description
	Down	Cisco cBR-8 device to RPD association is not formed and the L2TP tunnel creation process is down.
	Online/Up	Online-Cisco cBR-8 device to RPD association is formed and the L2TP tunnel creation process is initiated. Up-Cisco cBR-8 device to RPD association is completed and the link is active.
	In Progress	The status of Cisco cBR-8 device to RPD association is being discovered.
	Deployment Pending	Cisco cBR-8 device to RPD association is not formed and hence the L2TP tunnel creation process is not initiated.
	Defined	RPD device is created without MAC ID.

For more information about the service states icons in the Link 360 view, see Link Serviceability States.

Fiber Node Utilization of cBR-8 Device

The Fiber Node Utilization dashboard is a comprehensive dashboard where user can view details of upstream/downstream channel utilization, associated MAC domain, RPDs and cable modems against a fiber node. User can configure the threshold values to help classify the utilization of upstream and downstream channels, and get a broader picture for each cBR-8 device.

> **Note** Information about other interfaces such as Bundle, MAC Domain, Video, and Phyical interfaces are displayed under the **Interface** tab in the **Chassis View** page.

The cable monitoring policies (specifically, FiberNode Modem Count and few more policies for Beta features) must be enabled before using the Service Utilization feature. For more information on cable policies, see Cable Policy.

To view the service utilization:

1. Go to **Inventory** > **Device Management** > **Network Devices**, and click on any cBR-8 device under the **Device Name** column. This opens the **Chassis View** for the selected device.

2. Click on the **Utilization** tab. The fiber node untilization details for the selected cBR-8 device is displayed here.

The fiber node utilization percentages for upstream and downstream channels are displayed in various colored thresholds. Click the Global Threshold Settings icon (gear icon) to customize these utilization thresholds for upstream channel and downstream channel. The changes made here will be applicable for all devices. By default, the threshold values are 0-25%, 26-50%, 51-75% and 76-100%. Clicking on any of the threshold categories will filter the fiber node table as per category selected.

> **Note** The **Reset to Defaults** option in the **Global Threshold Settings** page restores the default threshold values for both upstream and channels.

Each column in the Utilization tab, when clicked, gives information about the device metric. For example, when a downstream channel number is clicked, opens the **Downstream Channels** pop-up window which gives information of the selected channels such as fiber node ID, description, utilization (overall and channel-wise), and so on. Similarly, clicking on an upstream channel number opens the **Upstream Channels** pop-up window which gives information of the selected channels such as fiber node ID, description, utilization (overall and channel-wise), and so on.

Table 6: Service Utilization

Type of Service Utilization Window	Available Information
Fiber Node Utilization / General Information	Fiber Node ID Fiber Node Description Downstream Details: DOCSIS Utilization and Number of Downstream Channels Upstream Details: DOCSIS Utilization and Number of Upstream Channels Service Group profile MAC Domain RPD Count Modem Count Offline Modems (percentage)
Downstream channels	Fiber Node ID Description DOCSIS Utilization (percentage) RF Resil State Channel Utilization (channel-wise) (percentage) Type Frequency (Mhz) **Note** This pop-up window also indicates the number of downstream channels that are currently down.
Upstream channels	Fiber Node ID Description DOCSIS Utilization (percentage) Channel Utilization (channel-wise) (percentage) Type Modulation Profile

Type of Service Utilization Window	Available Information
RPD Count	Fiber Node ID Description DPIC Port Name MAC ID **Note** You can launch the RPD 360 view by clicking the *i* icon here. Modulation Profile
Modem Count	Modem Status (Offline, Online, Initialization, Partial Online, Other) (percentage). You can also see the data in the form of donut chart. Status MAC Address IP Address DOCSIS Version Mode US Power USMER (SNR) DS Power DSMER (SNR)
Offline Modems	Offline modem count (percentage)

Cable Modem Flap List Troubleshooting

Cisco EPN Manager supports flap list troubleshooting across multiple cBR-8 devices. The Flap Details page tracks "flapping" cable modems, which are cable modems that have intermittent connectivity problems. The top metrics provides the details such as total number of cable modems, flapping modem count (including percentage of the total), and unique cable interfaces. However, they are not clickable. In addition, the summary pane also provides details of CRC, power adjusted, and reinsert modem counts along with relevant percentage. Clicking on any of these three tabs will filter the underlying table as per the condition selected.

To view the details of flapping modems:

1. Go to **Inventory** > **Device Management** > **Network Devices**, and click on any cBR-8 device under the **Device Name** column. This opens the **Chassis View** for the selected device.

2. Click on the **Flap Details** tab.

The **Flap Count** dashlet available in the Cable Modem dashboard provides the consolidated view of the flapping modems. You can also click the flap count hyperlink to open the Flap Details page.

The Flap Details page provides the following information.

Table 7: Flap Details

Type of Flap Details Window	Available Information
Totals	Modems Flapping Modems (along with percentage) Cable Interfaces
Modems with Metric Counts > 0	CRC (along with percentage) Power Adjusted (along with percentage) Reinsertions (along with percentage)
Flap Details table	MAC Address Cable Interfaces Insert Count Hit Miss CRC Power Adjusted Flap Last Time Flapped

View the Cable Dashboard

The Cable dashboard provides an executive overview of your cable network including the important issues currently affecting your network of Cisco cBR-8 devices. For more information, see Cable Dashboard Overview.

RPD Polling

The RPD polling information, displayed in the Cable Dashboard, can be dynamically changed by the user by editing the property file located at `/opt/CSCOlumos/conf/cable_poller.properties`.

The customizable attributes are as follows:

```
# RPD Polling task
rpd_12tp=10
#Power Supply task
cable_powerSupplyStatus=10
#HA Inventory task
cable_inventory_ha_core_redudancy=10
#License Dashboard task
cable_dashboard_license=10
#License Usage Dashboard task
cable_dashboard_license_usage=10
```

```
#Fan Status task
cable_FanStatus=10
```

> **Note** The default polling interval is 10 minutes, and the minimum polling time is 2 minutes. Caution is advised while editing the polling attributes as it can impact the server and device performance. For more information, please contact the administration team.

By default, Cisco EPN Manager polls all the connected devices, but user can customize it by specifying the IP address of the device that needs to be polled. However, if the IP address entered is incorrect or in the wrong format, none of the devices will be polled.

For example, in the instruction below specifies two device IP addresses to be polled at an interval of 10 minutes:

```
rpd_l2tp=10,10.20.123.222,10.20.133.111
```

User can enable or disable poll timer for a particular attribute by using the comment tag ('#') in the relevant instruction in the property file. While changing polling interval or adding IP address can be done dynamically, enabling or disabling a polling attribute requires the Cisco EPN Manager to be restarted.

For example, the instruction below (from the above example) has been commented out by using the comment tag ('#'):

```
#rpd_l2tp=10,10.20.123.222,10.20.133.111
```

Visualize the Topology of Cable Devices on the Network Topology

When RPDs are discovered from Cisco cBR-8 devices, you can view the L2TP and physical links, and other alarm information in the topology map. You can view cable devices in the network topology in the following ways:

> **Note** Cisco EPN Manager supports RPD physical link discovery in IPv4 and IPv6 networks.

- Click **Maps** > **Topology Maps** > **Network Topology** in the left navigation panel.
- Click the Geographical Map icon.
- Click the **Network Topology** hyperlink from the RPD Association page.

For more information on the network topology features, see View Your Network on a Geographical Map (Geo Map)

RPD MIB and Supported Alarms

User can collect RPD-related statistics by configuring the following MIB files:

- DOCS-RPHY-CTRL

- DOCS-RPHY-PTP

- DOCS-RPHY-MIB

For more information on the MIB Polling policy, see Custom MIB Polling Monitoring Policy

Troubleshooting Cable Devices

Problem:

Mismatch in the count of RPDs per service profile.

Cause:

Duplicate Cisco Smart PHY credentials. Cisco Smart PHY is registered with more than one Cisco EPN Manager server.

Workaround:

Ensure that Cisco Smart PHY is not integrated with more than one Cisco EPN Manager server. After you register Cisco Smart PHY credentials in the Client Credentials page, ensure that you do not update the client to any other instance of Cisco Smart PHY.

If you decide to use a different Cisco Smart PHY client, complete the following steps:

Note Before you proceed, we recommend that you export and save a local copy of Cisco cBR-8 devices and RPD data.

1. Delete all cBR-8 and RPD data from Cisco EPN Manager.

2. Configure the new Cable Network Automation client credentials.

3. Import the cBR-8 to RPD association details again.

Problem:

Edit RPD operation failing.

Cause:

Editing the RPD Name may fail in Cisco EPN Manager if the RPD to be edited does not exist in the Smart PHY application.

Workaround:

Edit any of the RPD parameters except the RPD Name. This ensures that the RPD is first added to the Smart PHY application. Once it is successfully added, editing the RPD Name will be possible in Cisco EPN Manager.

Problem:

High CPU usage in cBR-8 device.

Cause:

If the CPU of the cBR-8 device is idle, the CPU spikes may be seen momentarily during Cisco EPN Manager inventory collection. However, if there are high priority items running on the device, the SNMP requests from Cisco EPN Manager will be automatically throttled by the device.

Workaround:

No workaround as of now. If high priority items are running on the cBR-8 device, SNMP requests are automatically throttled by the device.