Information about Cisco Smart PHY

The Cisco Smart PHY application simplifies the installation, configuration, monitoring, and troubleshooting of Remote PHY Devices (RPD) serviced by Cisco cBR-8 routers. It enables multiple use cases, including:

- Distributed Access Architecture (DAA) deployment simplification
- RPD deployment automation
- RPD software lifecycle management
- CIN Traffic engineering
- Common DHCP policy

These are some general instructions and information for using the Cisco Smart PHY:

Icon	Description
	**Information** button. Click this button to display more information.
	**Context Menu** button. Move the mouse over this button to display a context menu.

- Benefits of Cisco Smart PHY, on page 1
- Dashboard, on page 2
- Inventory, on page 3
- RPD Automation, on page 6
- User Management, on page 20

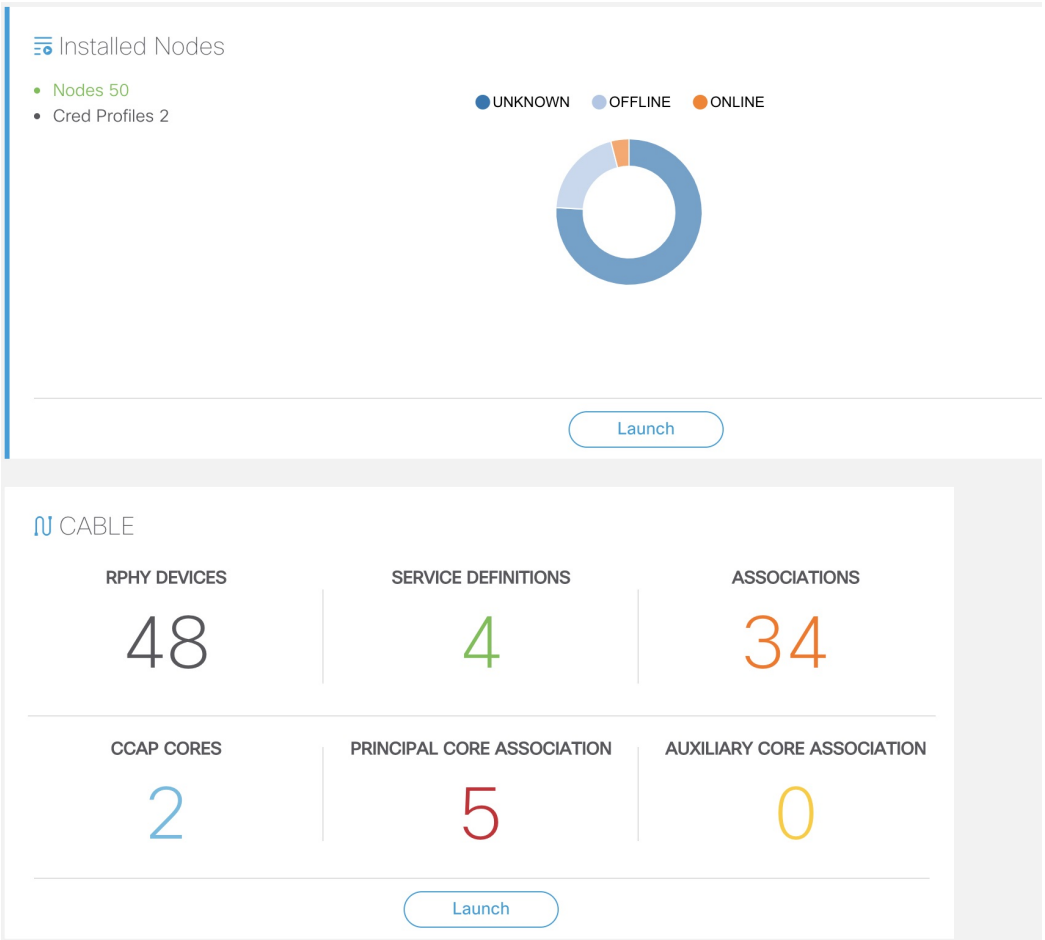
Benefits of Cisco Smart PHY

Following are some of the benefits of using the Cisco Smart PHY application:

- Initial RPD Zero-Touch Automation: Initial RPD installation and provisioning with Zero-touch of the Cisco CMTS.
- Inventory: Tracks RPD and CCAP resources, allowing operators to perform searches on several provisioning-specific criteria.

- Configuration generation and push: Generates error free Cisco cBR-8 RPD configuration and ensures that the configuration is pushed to the appropriate DOCSIS Principal and Video CCAP Cores.
- RPD SW management: Manages RPD software.
- API centric design: Direct programmatic access for operators to various Cisco Smart PHY services and functions using open interfaces and tools.
- Deployment validation: Monitors Cisco cBR-8 routers for unauthorized out-of-band changes to RPD configurations.

Dashboard



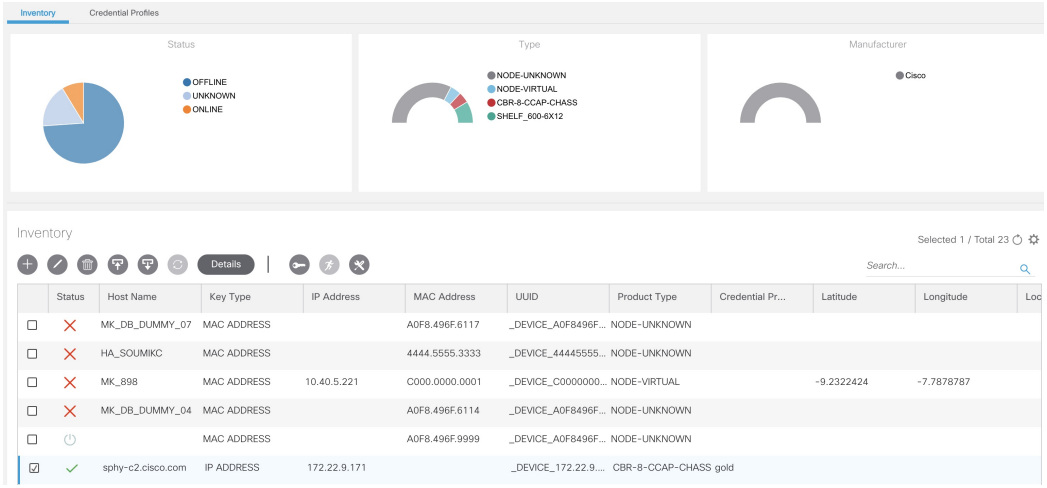
Following are the field descriptions:

Name	Description
Dashboard	Snapshot view of all devices managed and monitored by the Cisco Smart PHY application.

Name	Description
Installed Nodes	Shows the number of nodes installed using the Cisco Smart PHY application. This panel also shows the number of Credential Profiles available in the application. The pie chart shows the offline, online, and unknown (unmanaged cores) nodes.
Launch	Takes you to the specific page view.
Cable	Shows the following details in this pane: configured and managed using the **RPD Automation** page. • RPHY Devices • Service Definitions • Associations • CCAP Cores • Prinicipal Core Association • Auxiliary Core Association Click the number to view more details. Click the **Launch** link to go to the **RPD Automation** page.

Inventory

Inventory has two tabs; Inventory and Credential Profiles.



Inventory

The **Inventory** tab enables you to onboard and organize your managed and unmanaged CCAP Cores.

Note Add the RPDs through the Cable Pairing table in the Cisco Smart PHY application and not through the Inventory tab.

Cisco Smart PHY supports 50000 RPDs on a 3-node cluster. Because the number of RPDs provisioned by the Cisco Smart PHY scales into such huge numbers, we recommend that the Operators work on Cisco Smart PHY programmatically through its REST API.

Following are the field descriptions for Inventory:

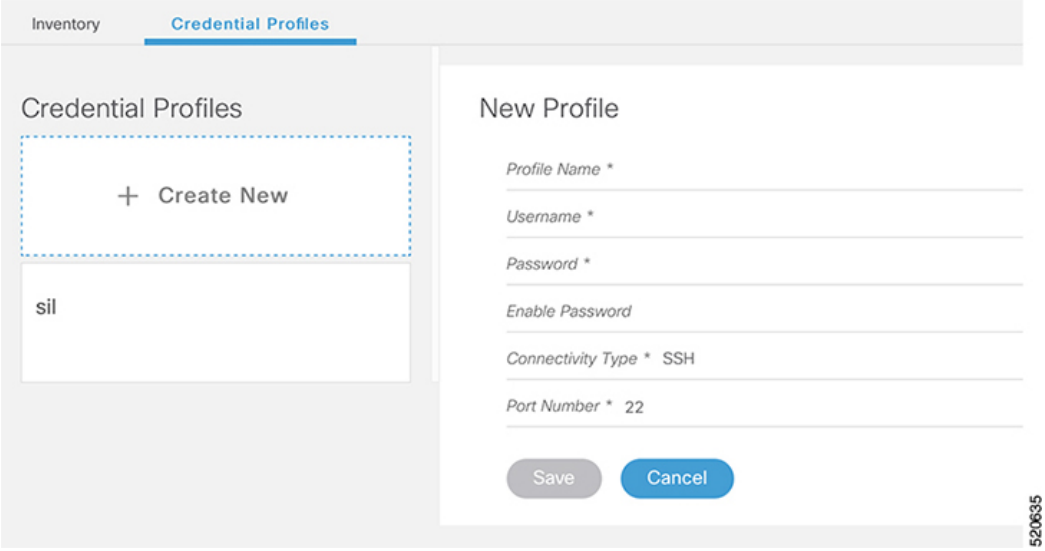
Name	Description
Status	Shows a graphical pie chart of all devices in the network, categorized by status: • ONLINE • OFFLINE • UNKNOWN • SSHKEYFETCH • MAINTENANCE • NORMALOPS_PROGRESS
Host Name	Host name of the device.
Key Type	Two types: • MAC ADDRESS • IP ADDRESS
IP Address	IP address of the device.
MAC Address	MAC address of the device.
UUID	Universally unique identifier of the device.
Product Type	Product type of the device.
Credential Profile	Credential profile name.
Latitude	Latitude of the device.
Longitude	Longitude of the device.
Location	Location of the device.
Description	Description of the device.
Software Version	Software version of the device.
Model Number	Model number of the device.

Name	Description
	Adds a device to the existing inventory.
	Edits the device information.
	Deletes a device from the inventory.
	Imports devices by using a CSV file.
	Exports device information to a CSV file.
	Synchronizes RPD states manually by fetching the latest RPD status.
	Enables maintenance mode on one or more Cisco cBR-8 routers. Applicable only to Cisco cBR-8 routers.
	Resumes normal operations on one or more Cisco cBR-8 routers. Applicable only to Cisco cBR-8 routers.
	Fetches the SSH key on one or more Cisco cBR-8 routers. Applicable only to Cisco cBR-8 routers. Cisco Smart PHY 3.1.4 and later, supports SSH key fetch from offline and online Cisco cBR-8 routers. The SSH key fetch states are the following: • SSHKEYFETCH_IN_PROGRESS • SSHKEYFETCH_FAILED For more details, see the section Fetch SSH Keys from Cisco cBR-8.
	Status showing SSH key failure.
	Status shows one of the following states: • Fetching SSH Keys • Resuming Normal Operations from the maintenance mode
Details	Shows the details of the devices, such as Device Summary and Device State History
	Sets the columns in the device table.
Search	Allows you to search for and filter the network devices.
Devices table	Shows detailed information about each device in the network.

Credential Profiles

Credential profiles are collections of device credentials for Telnet or SSH network devices. Using credential profiles lets you apply credential settings consistently across devices. When you add or import devices, you specify the credential profile the devices use. If you need to make a credential change, such as changing a device password, you can edit the profile to update the settings across all devices that use that profile.

Figure 1: Credential Profiles



Following are the field descriptions for Credential Profiles:

Name	Description
+ Create New	Allows you to add or edit a credential profile. **Note** Mandatory fields are marked with an asterisk.
New Profile	You can create a new profile by entering the required details and saving the profile.

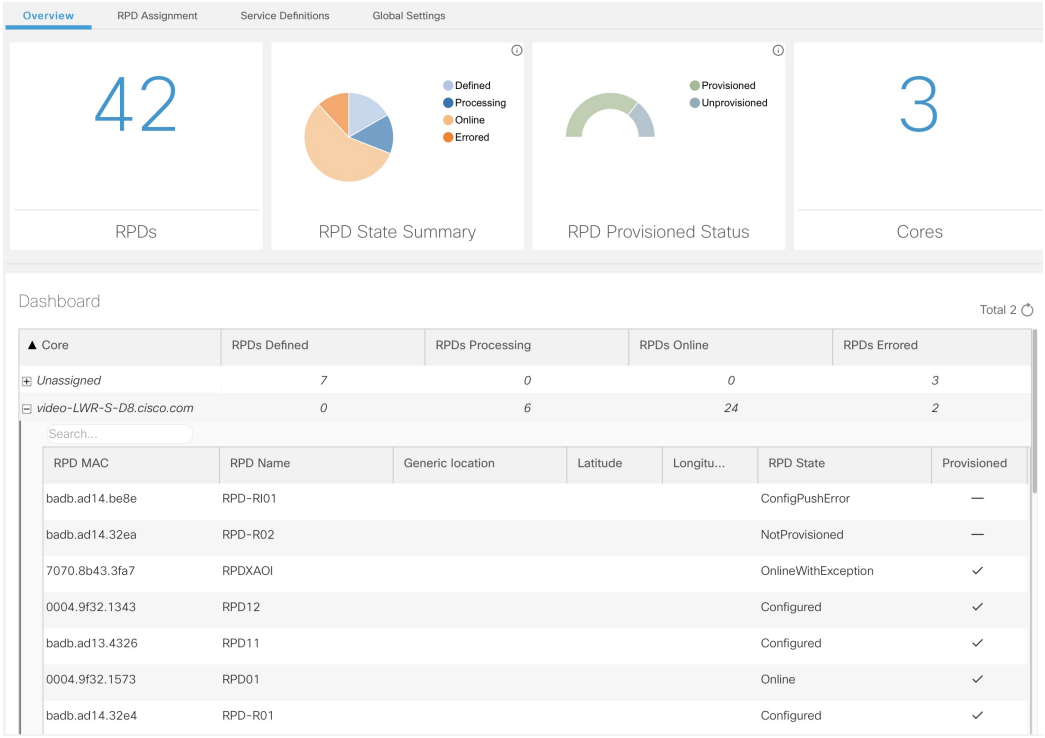
RPD Automation

The **RPD Automation** page enables you to add, organize, and update information about CMTS and RPD devices in the network. The information available in the view is focused on CCAP Cores and Remote PHY Devices.

The **RPD Automation** page has four tabs; Overview, RPD Assignment, Service Definitions, and Global Settings.

Overview

Provides a view of the number of RPDs, their status, and the number of Cores. Also, it provides a dashboard view of the Core and the RPDs in different states.



You can view the following RPD State Summary table by clicking the ⓘ icon in the RPD State Summary dashlet.

Table 1: RPD States Summary

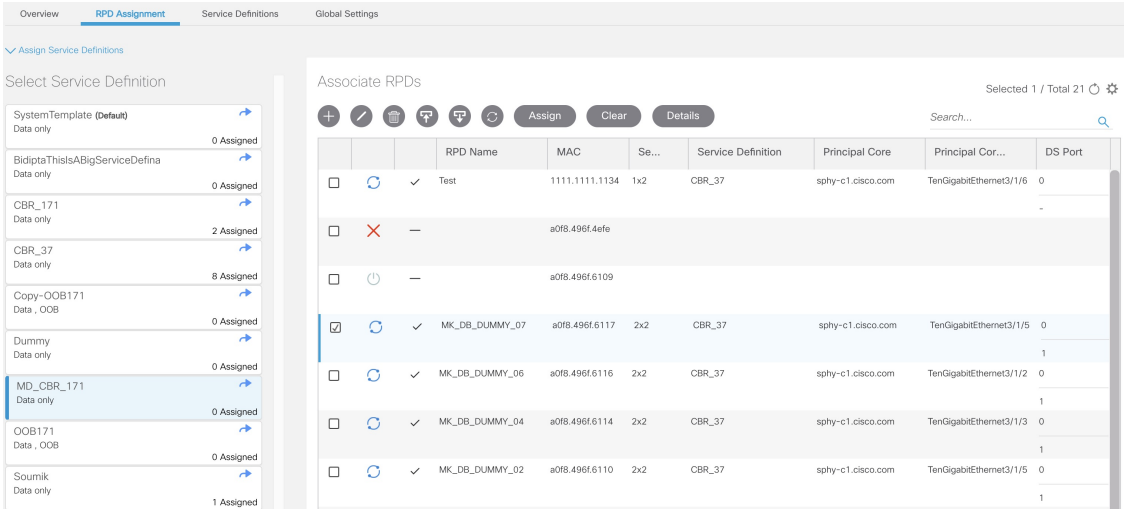
RPD Summary	RPD State	Description
DEFINED	Defined	RPD pairing is defined. However, MAC address is not yet assigned.
DEFINED	Installed	Installed RPD. RPD name, MAC address, and the GPS location are available.
DEFINED	Inventory	Added RPD MAC address to the inventory without the GPS details.
ERRORED	ConfigNotFound	RPD assignment is incomplete or not specified in the Cisco Smart PHY application.
ERRORED	ConfigPushError	Unable to push the RPD configuration to the CCAP core.
ERRORED	ConfigReadError	Unable to get the existing CCAP core configuration.
ERRORED	ConfigurationError	Assigned incorrect RPD in the Cisco Smart PHY application.

RPD Summary	RPD State	Description
ERRORED	GcpRedirectError	Received an error from the RPD when redirecting to the CCAP core.
ERRORED	NotProvisioned	Cisco cBR-8 router is not provisioned with the RPD configuration. RPD configuration is not pushed to the Cisco cBR-8 router.
ERRORED	Offline	RPD is offline. However, RPD configuration is pushed to the CCAP core.
ERRORED	ResourceAllocationError	Unable to allocate resources to an RPD for the assigned CCAP core or interface.
ONLINE	Online	RPD is online on the CCAP core.
ONLINE	OnlineWithException	RPD is online, but NDF or NDR fails.
ONLINE	PartialOnline	Parttial services are available if the RPD is not online on all cores.
PROCESSING	Configured	CCAP core is configured. RPD configuration is pushed to the CCAP core.
PROCESSING	DeletePending	RPD pairing deletion is pending.
PROCESSING	GcpRedirected	Received an ACK from the RPD for the CCAP core redirect message. This redirect message captures the result of the redirect request, initiated by the Cisco Smart PHY application, along with the hostname, the IP address, and the interface of the redirected core.
PROCESSING	GcpRedirectStartedWithException	RPD configuration is pushed to the CCAP core and redirecting the RPD to that core has started. However, one of the following errors occurred: • RouterVersionIncompatible • StaticRouteNotConfigured
PROCESSING	GcpRedirectStarted	RPD configuration is pushed to the CCAP core and the RPD is redirected to that core.
PROCESSING	GcpRedirectedWithException	Received an ACK from the RPD for the CCAP core redirect message. However, one of the following errors occurred: • RouterVersionIncompatible • StaticRouteNotConfigured

RPD Summary	RPD State	Description
PROCESSING	GcpUp	Received GCP message from the RPD.
WARNING	RouterVersionIncompatible	RPD software version is incompatible with the CCAP core version.
WARNING	StaticRouteNotConfigured	Static route is not configured.

RPD Assignment

Allows you to add, edit, import, or export the details of RPD assignments. Search allows you to search for or filter the RPD information.



Following are the menu options available on the RPD Assignment window:

Options	Description
	To assign an RPD for a specific RPD name or to add an RPD MAC address to the RPD Inventory. You can assign additional RPD information only after specifying a name for the RPD MAC address.
	To edit an existing RPD assignment. You can edit the name, the MAC address information, and so on.

Options	Description
	To delete an RPD name and its RPD assignment information. When you delete the RPD Assignment details, the RPD MAC address that is assigned to the RPD name is moved back to the Inventory and is retained in the system. To delete the RPD MAC address, delete it from the main Inventory page. Similarly, deleting an RPD MAC address from the Inventory does not delete the RPD name and its assignment information in the RPD Assignment table. This deletion removes only the RPD MAC address from the RPD Assignment table.
	Imports the details of RPD assignments using a CSV file. Sample of the CSV file is available when you click this icon.
	Exports the details of RPD assignments to a CSV file.
	Synchronizes RPD states manually by fetching the latest RPD status.
Assign	To assign the chosen Service Definition to all the selected RPDs.
Clear	To clear the core and the service template assignment for a specific RPD name. This option does not clear the mapping between an RPD name and the MAC address.
Details	To get the details of the RPD, such as RPD Summary, RPD State History, and RPD CLI.
Search	Use any filtering option.
	Sets the required columns in the device table.

Following are the field descriptions in the Associate RPDs table:

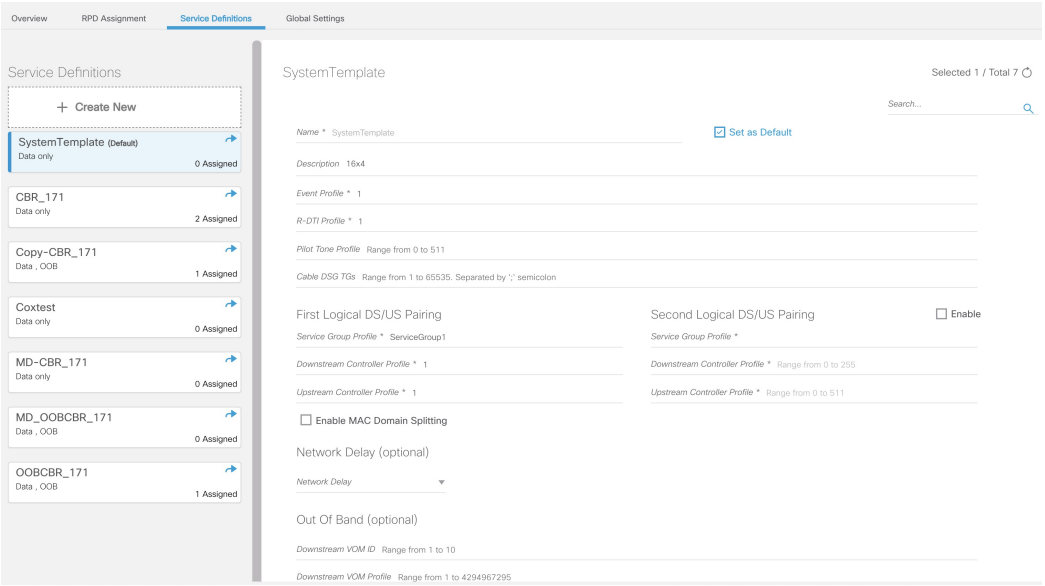
Field Name	Description
Status	Shows the status of the RPDs.
Provisioned	Shows whether the RPD is provisioned or not.
RPD Name	Name for the RPD. This RPD name is also used in the `cable rpd` CLI command.
MAC	MAC address of the RPD.
Segmentation	Node segmentation of the RPD: 1x1, 1x2, or 2x2.

Field Name	Description
Service Definition	Service Definition as created in the **Service Definitions** tab. If Cisco Smart PHY does not manage the principal CCAP core and if the **Principal Core** field is empty, then this **Service Definition** field is optional.
Principal Core	The name of the managed Cisco cBR-8 router or the unmanaged Core, which is the Principal Converged Cable Access Platform (CCAP) Core for the RPD.
SSD Profile	Secure Software Download (SSD) profile details for image storage.
Disable Network Delay	The default is value is **No**. • No: Apply the network-delay from service definition to RPD. • Yes: Do not apply the network-delay from service definition to RPD. Changing this value to `yes` is service impacting, if the RPD's assigned Service Definition/Template has network-delay configured.
Principal Core Interface	If the Principal Core is a managed Cisco cBR-8 router, the name of the TenGigabitEthernet DPIC interface is listed in this field. If the Principal Core is an unmanaged Core, the field is empty.
Video Core	Name of the Cisco cBR-8 router, which is the auxiliary CCAP core for the RPD that provides video services.
Video Core Interfaces	List of complete names of the TenGigabitEthernet DPIC interfaces to be used for Video Services.
OOB Core	Name of the Cisco cBR-8 router which is the CCAP core for the RPD that provides out-of-band (OOB) SCTE 55–1 service and NDF/NDR services.
OOB Core Interface	Complete name of the TenGigabitEthernet DPIC interface to be used for out-of-band 55-1 and NDF/NDR service.
Downstream VOM ID	OOB 55-1 Downstream Virtual out-of-band Modulator (VOM) Identification (ID). If present, this value overrides the value from the Service Definition.
Downstream VOM Profile	OOB 55-1 Downstream VOM profile. If present, this value overrides the value from the Service Definition.
Upstream VARPD ID	OOB 55-1 Upstream Virtual Advanced Return Path Demodulator (VARPD) ID. If present, this value overrides the value from the Service Definition.
Upstream VARPD Profile	OOB 55-1 Upstream VARPD profile for first logical Downstream/Upstream (DS/US) pairing. If present, this value overrides the value from the Service Definition. The Upstream VARPD Profile (upstreamVarpdProfile) and the Second Upstream VARPD Profile (secondUpstreamVarpdProfile) can have the same value. For more details, see Common OOB 55-1 US Profile for Cisco RPD 1x2/2x2.

Field Name	Description
Second Upstream VARPD Profile	OOB 55-1 Upstream VARPD profile for second logical Downstream/Upstream (DS/US) pairing. If present, this value overrides the value from the Service Definition. The upstream VARPD profile (upstreamVarpdProfile) and the second upstream VARPD profile (secondUpstreamVarpdProfile) can have the same value. For more details, see Common OOB 55-1 US Profile for Cisco RPD 1x2/2x2.
Cable DSG TGs	Semicolon separated list of DOCSIS Set-Top Gateway (DSG) Tunnel Group (TG) identifications. If present, this list overrides the list from the Service Definition.
Additional Cores	Semicolon separated list of additional cores to which the RPD must connect.
Latitude	Latitude of the RPD (GPS coordinates)
Longitude	Longitude of the RPD (GPS coordinates)
RPD Description	Description for the RPD

Service Definitions

Allows you to add, edit, delete, or assign service templates. Fields that are not marked as optional are mandatory.



Following are the menu options descriptions:

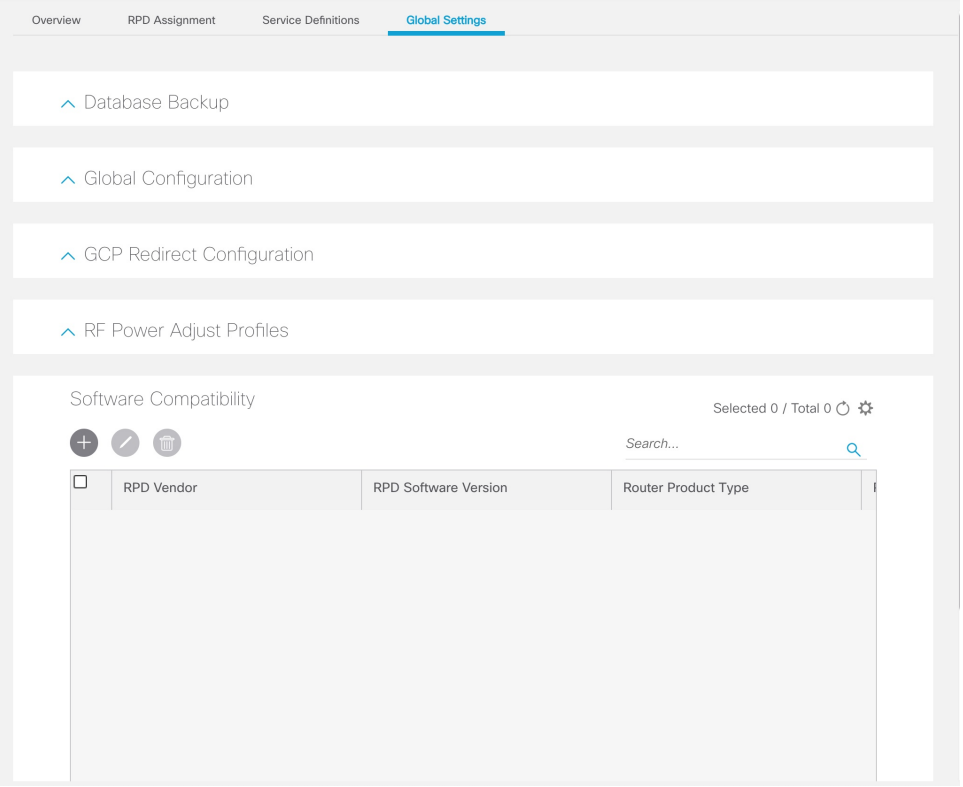
Name	Description
+ Create New	Click this option to create a new service template.
Name of the existing service definition	Click the name of the existing service definition to edit the template.

Name	Description
New Service Definition	Enter the details in each filed and click the **Save** button to create a new service template.
Search	Use this Search text field in upper right-hand corner to filter service definition names.

Global Settings

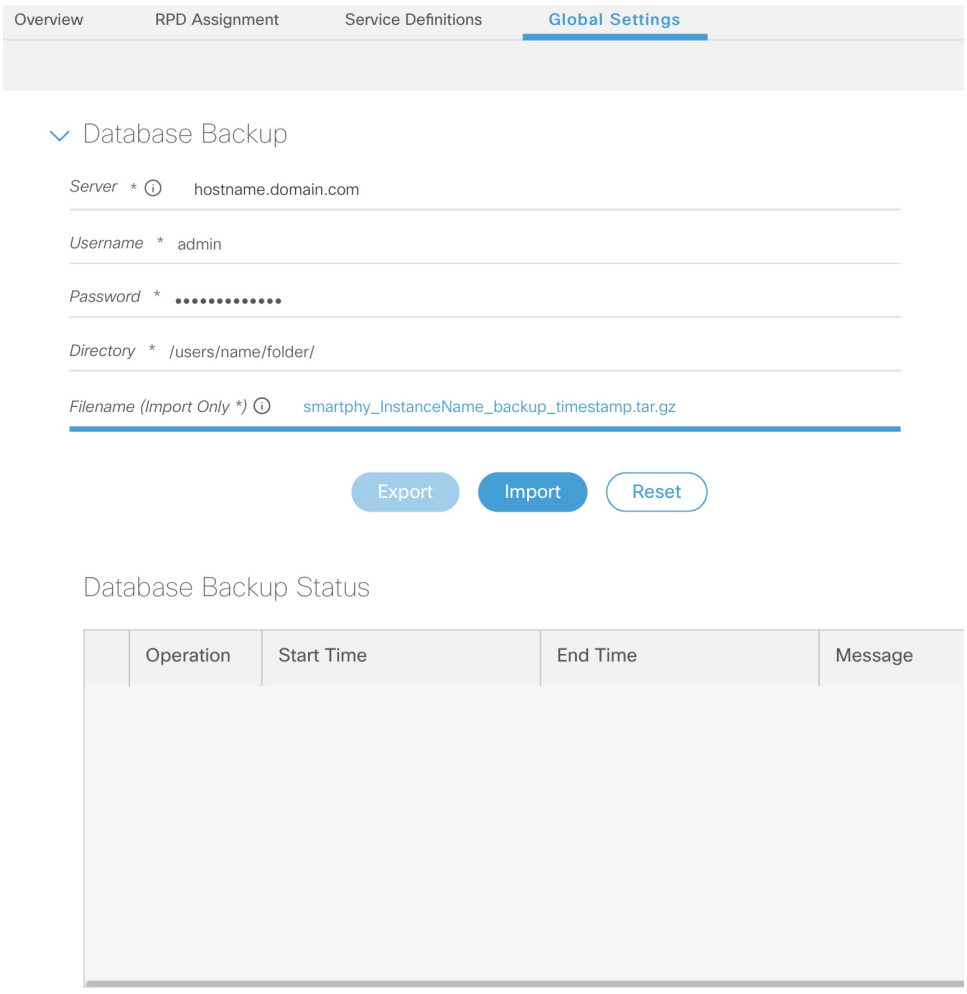
You can perform the following configurations from the Global Settings window.

- Database Backup
- Global Configuration
- GCP Redirect Configuration
- RF Power Adjust Profiles
- Software Compatibility



Database Backup

You can back up the database to a local server or a remote server.



The database backup file is a `TAR.GZ` file with the following naming convention: `filename_YYYYMMDD_HHMMSS.tar.gz`. For example, `aio_backup_20210318_121354.tar.gz`. Enter the following details in the **Database Backup** window to back up the database.

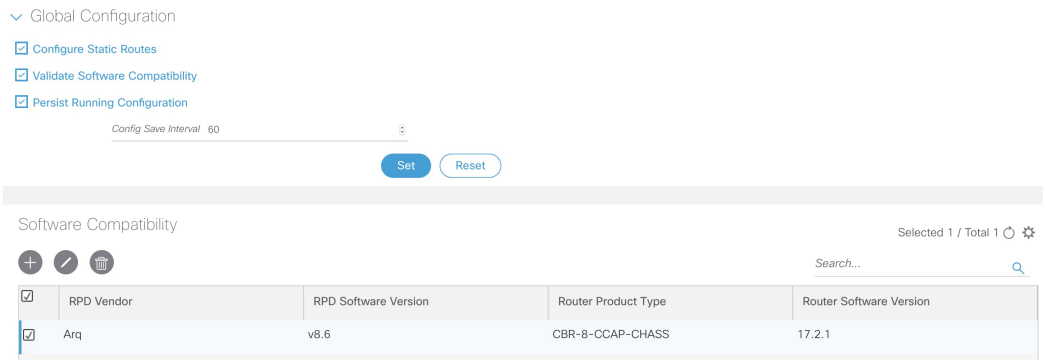
Field	Description
Server	The location where you want to save the DB. • Local backup—Enter **localhost**. Local backup files are saved to the `/var/smartphy/backup` directory on the local filesystem. • Remote backup—Enter the IP address or the principal coreFQDN of the remote host. For remote backup, the Cisco Smart PHY application uses SFTP to transfer files from Cisco Smart PHY instances.
Username	• Local backup—Leave the field empty. • Remote backup—Enter the username for the remote server access.

Field	Description
Password	• Local backup—Leave the field empty. • Remote backup—Enter the password for the remote server access.
Directory	• Local backup—Leave the field empty. • Remote backup—Enter the file path of the directory in the remote server.
Filename (Import Only)	Used exclusively for importing a database. Imported file must be in the following format: `smartphy_InstanceName_backup_timestamp.tar.gz` • Local backup: Enter only the filename of the backup file available in the default directory: `/data/smartphy/backup` • Remote backup: Enter the file path (absolute path) of the remote server.
Export	Click the **Export** button to perform local and remote backup.
Import	Click the **Import** button to import a DB.

Global Configuration

The **Global Configuration** section under the **Global Settings** menu provides the following options for you to configure on RPDs. Choose the following functions according to your requirement.

- Configure Static Routes—If you enable this option, for interfaces with /31 (IPv4 networks) or /127 (IPv6 networks) configured on the DPIC, the Cisco Smart PHY application adds a static route configuration on the Cisco cBR-8 router per RPD.
- Validate Software Compatibility—If you enable this option, the Cisco Smart PHY application checks the compatibility between the RPD version and the Cisco cBR-8 router version that is specified in the table.
- Persist Running Configuration—If you enable this option, when the Cisco Smart PHY makes a change to the Cisco cBR-8 configuration, the Cisco Smart PHY makes the configuration persistent. This option allows you to make the changes persistent on the Cisco cBR-8 router at a specific interval.



Static Route

To route traffic and for communication between an RPD and a Cisco cBR-8 router, static routes to the Cisco cBR-8 router are created when you configure the RPDs.

Smart PHY automatically creates a static route for the RPD if the DPIC interface is configured with a /31 (IPv4 networks) or /127 (IPv6 networks) subnet. The static route is determined by calculating the gateway IP address and routing traffic through the gateway for the RPD.

Note

- The DPIC must be a /31 or /127 subnet.
- Wait for the RPD to push the static route configuration.

Sample of a Cisco Smart PHY-Generated Configuration

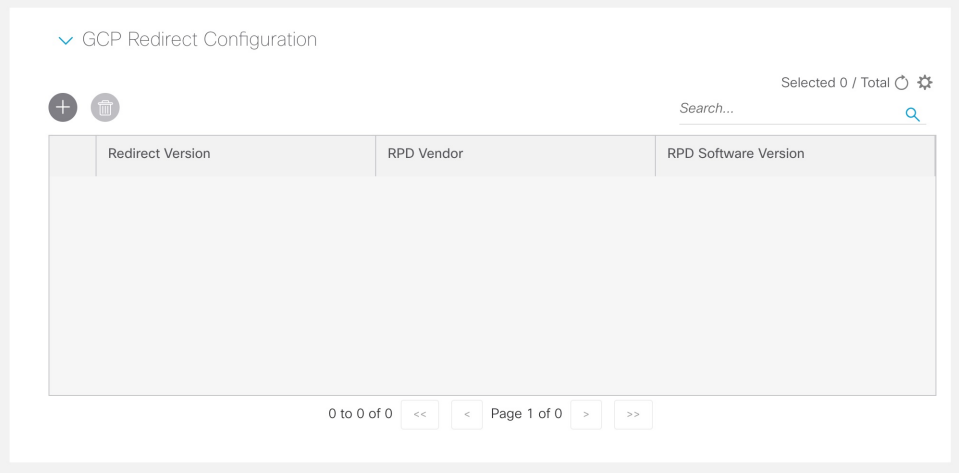
```
cable rpd <the name assigned to the RPD>
 identifier a0f8.496f.6506
 type shelf
 rpd-ds 0 base-power 25
 rpd-ds 1 base-power 25
 core-interface Te9/1/6
  principal
  rpd-ds 0 downstream-cable 9/0/16 profile 100
  rpd-us 0 upstream-cable 9/0/1 profile 4
 r-dti 2
 rpd-event profile 0
rpd-55d1-us-event profile 0

cable fiber-node <next available fiber-node>
 downstream Downstream-Cable 9/0/16
 upstream Upstream-Cable 9/0/1
 downstream sg-channel 0 23 downstream-Cable 9/0/16 rf-channel 0 23
 upstream sg-channel 0 3 Upstream-Cable 9/0/1 us-channel 0 3
 service-group managed md 0 Cable 9/0/1
 service-group profile SG1
```

GCP Redirect Configuration

Cisco Smart PHY application supports GCP-redirects in compliance with the I15 revision of the CableLabs Remote PHY specification. By default, the pre-I15 GCP-redirect behavior is applied to all RPDs. You must enable the I15 GCP-redirect behavior.

Figure 2: GCP Redirect Configuration



Configure I15 GCP Redirect

Cisco Smart PHY provides the flexibility to configure I15 compliant GCP redirect messages. I15 GCP redirect messages are enabled based on the RPD vendor and the RPD software version. If a matching pattern is available, Cisco Smart PHY initiates GCP redirect message in I15 format. Or the Cisco Smart PHY application continues to send pre-I15 GCP-redirect messages. In such environments, Cisco Smart PHY provides both exact pattern match and regex patterns.

Before configuring I15 GCP Redirect, ensure that your RPDs are compatible with I15 of the Remote PHY specification.

Create an I15 GCP Redirect

Step 1 Choose Cisco Operations Hub main menu > **Smart PHY** > **RPD Automation** > **Global Settings** > **GCP Redirect Configuration**.

Step 2 Click the add icon ( ).

Step 3 Enter RPD Vendor (For example: Cisco or Cisco.*) and RPD Software Version (For example: v.9.4 or v.9.*).

Step 4 Click **Save** to add GCP redirect configuration.

Note The changes are stored in Smart PHY database. You can export or import them using database export and import operations.

I15 GCP Redirect APIs

Following are the I15 GCP Redirect APIs:

set-redirect-version

The API is used to add GCP redirect version details.

API URL: `https:///rpd-service-manager/rpdorch/v2/gcp/set-redirect-version`

Add the following fields in the request payload:

Field Name	Description
redirectVersion	GCP Redirect Version
rpdVendor	RPD Vendor name
rpdVersion	RPD Software Version

In the following example, Cisco Smart PHY searches for an exact match in the RPD vendor value, while evaluating the software version against a regex pattern:

```
{
  "redirectVersion": "I15",
  "rpdVendor": "**Cisco**",
  "rpdVersion": "v9.*"
}
```

remove-redirect-version

The API is used to remove an already configured GCP redirect record from the Cisco Smart PHY application.

API URL: `https:///rpd-service-manager/rpdorch/v2/gcp/remove-redirect-version`

Add the following fields in the request payload:

Field Name	Description
rpdVendor	RPD Vendor name
rpdVersion	RPD Software Version

Example:

```
{
   "rpdVendor": "Cisco",
       "rpdVersion": "v9.*"
}
```

query-redirect-version

The API is used to query all GCP-redirect version details from the Cisco Smart PHY application.

API URL: `https:///rpd-service-manager/rpdorch/v2/gcp/query-redirect-version`.

This API does not have any parameters.

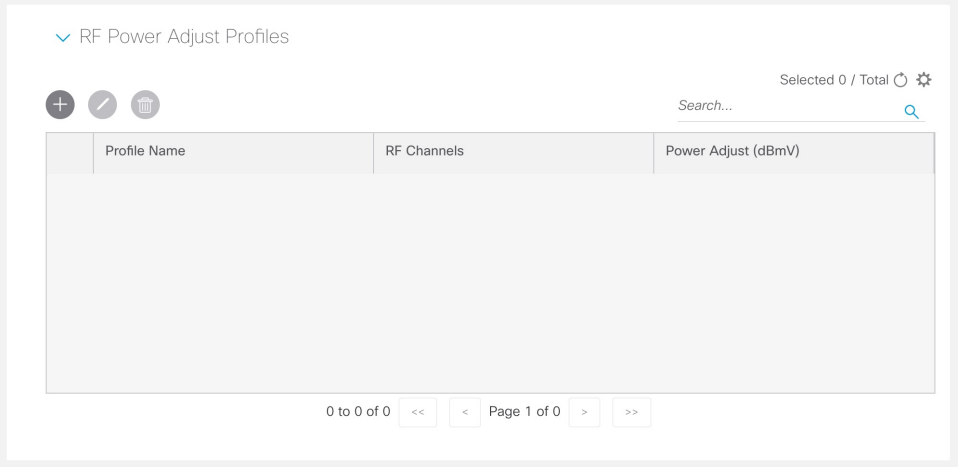
I15 GCP-redirect Result Notification

The Cisco Smart PHY application displays the result of the `GCP Redirect Notification` in the **Associate RPD Details** panel.

When redirect errors occur, Cisco Smart PHY displays the RPD status as `GcpRedirectError`. The `GcpRedirected` state indicates that the redirect message is processed successfully by the RPD.

RF Power Adjust Profiles

Figure 3: RF Power Adjust Profiles



Cisco Smart PHY application allows you to adjust the power levels for a single or a group of downstream RF channels using RF Power Adjust Profile. An RF Power Adjust Profile consists of a profile name, a channel identifier and a power adjust value. RF power adjustment does not affect the service of the RPDs. You can adjust the power for a single RF channel (for example 10), multiple RF channels (for example 10 and 20), multiple consecutive RF channels (for example from 10 through 20), or a combination of the previous items from **Cisco Operations Hub main menu** > **RPD Automation** > **Global Settings** > **RPD Power Adjust Profiles**.

After you create an RF Power Adjust Profile, you can attach it to a Service Definition. You cannot delete an RF Power Adjust Profile that is already used in a Service Definition. If you modify an RF Profile, updated configuration will not be applied to the RPD's that are already provisioned. You need to go to appropriate Service Definition page, click **Save & Assign**, select specific RPD and click **Assign**.

Software Compatibility

Allows you to add, edit, or delete the software compatibility matrix. Fields that are not marked as optional are mandatory.

Software Compatibility—This window displays a compatibility matrix for the RPD software versions and the Cisco cBR-8 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, either manually upgrade the RPD software or associate the RPD with an SSD profile through the Cisco Smart PHY application, which notifies the Cisco cBR-8 for the software upgrade.

Table 2: Field Description for Software Compatibility Matrix

Name	Description
RPD Vendor	Name of the RPD vendor.
RPD Software Version	Software version running on the RPD.
Router Product Type	Product type of the router from the Inventory. Example: CBR-8-CCAP-CHASS

Name	Description
Router Software Version	Software version of the router.

User Management

Administrators can manage users in the Cisco Smart PHY application by using the **Systems** > **Users & Roles** menu option. For more details, see Configure Local Users.

Note Only Administrators can access the **User & Roles** option.