Managing RPDs

Smart PHY provides a single pane of glass to easily onboard Remote PHY Devices (RPDs). See:

Managing RPD Associations

Table 1: Feature History

Feature Name	Release information	Description
Support for 128 RPDs per Line Card	Cisco Smart PHY, Release 24.2	Smart PHY's supports 128 RPDs per Line Card. A total of 32 DOCSIS Service Groups + 32 Video Service Groups can be configured on a Kobol-R line card (CBR-CCAP-LC-G2-R). This adds support for an additional 32 new Video Service Groups (downstream-video) in addition to the existing 32 Service Groups (downstream-cable).

Feature Name	Release information	Description
Modernized and Refreshed UI for RPD Association	Cisco Smart PHY 22.2	Modifications in the RPD Association Smart PHY UI: • Filtering based on all, provisioned and unprovisioned RPDs • Status for assigned RPDs • Import or export the database from/to local operations hub cluster or remote server. • (Optional) Password protect the database files (following password creation rules) during import and export operations. • Ability to view the history of Operations in a table format. • Enhanced search facility to search based on imported or exported RPD data. • Export the history of operations information.
US Port Description	Cisco Smart PHY 22.3	Smart PHY can be used to set a description for the Upstream Port level. Description can be set while creating and editing RPD operations. RPD-US Port Description can be set at Port 0, Port 1 or both Port 0 and Port 1 based on RPD segmentation (1x1, 1x2 and 2x2). RPD US Port Description can be Imported & Exported. US Port Description is not a service impacting change.
Shelf and Base Power Enhancements	Cisco Smart PHY 22.3	When RPD is provisioned as a "SHELF", the ‘type shelf’ CLI is pushed to both Principal and Aux Core(s). Along with Base-power, if Tilt Pivot Freq and Tilt Slope are configured, then they are also be pushed to all the cores.

Feature Name	Release information	Description
Configure US RF base-power level	Cisco Smart PHY 22.4	You can configure Upstream RF Base Power level. The valid range is -20 to 40 (dBmV).

The **RPD Associations** page enables you to add, organize, and update information about CMTS and RPD devices in the network. For more information, see:

- Remote PHY Device Association, on page 4
- Service Definitions

Once an RPD is provisioned, the RPD may undergo state transitions as shown in the following table:

Table 2: RPD State Summary

RPD Summary	RPD State	Description
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 obtain the existing CCAP core configuration.
ERRORED	ConfigurationError	Assigned incorrect RPD in the Cisco Smart PHY application.
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	OFFLINE	RPD is offline.
ERRORED	ResourceAllocationError	Unable to allocate resources to an RPD for the assigned CCAP core or interface.
ERRORED	SSHKEYFETCH_FAILED	Unable to obtain the SSH key.
GCP	GcpRedirected	Received an ACK from the RPD for the CCAP core redirect message. This redirect message captures the result of the redirect request, which is initiated by the Cisco Smart PHY application, along with the hostname, the IP address, and the interface of the redirected core.
GCP	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
GCP	GcpRedirectStarted	RPD configuration is pushed to the CCAP core and the RPD is redirected to that core.
GCP	GcpRedirectStartedWithException	RPD configuration is pushed to the CCAP core and the process of redirecting the RPD to that core starts. However, one of the following errors occurs: • RouterVersionIncompatible • StaticRouteNotConfigured
GCP	GcpUp	Received GCP message from the RPD.
ONLINE	Online	RPD is online for the CCAP core.
PROCESSING	ConfigPush	Configuration push to CCAP is in progress.
PROCESSING	DeletePending	RPD pairing deletion is pending.
PROCESSING	NORMALOPS_PROGRESS	The CCAP is returning to Normal Operation.
PROCESSING	RECONCILIATION_PROGRESS	Reconciliation in progress
PROCESSING	SSHKEYFETCH_IN_PROGRESS	The process of obtaining the SSH key is in progress.
UNKNOWN	UNKNOWN	Unknown RPD State
WARNING	OnlineWithException	RPD is online, but NDF or NDR fails.
WARNING	PartialOnline	Partial services are available.
WARNING	RouterVersionIncompatible	RPD software version is incompatible with the CCAP core version.
WARNING	StaticRouteNotConfigured	Static route is not configured.

Remote PHY Device Association

The remote PHY device association feature enables you to create either a remote PHY device or in bulk using CSV upload.

Use the following table to configure the fields under **Create Remote PHY Device Association**:

Table 3: Creating Remote PHY Device Association

Field	Description
General	
RPD Device Name	Enter the RPD name. Smart PHY uses this name in the **cable rpd** command.
RPD MAC	Enter the MAC address of the RPD.
Description	Enter the RPD Description. The maximum limit is 80 characters
Tags	You can select one or more of the existing tags or create new tags and add it to the RPD Association.

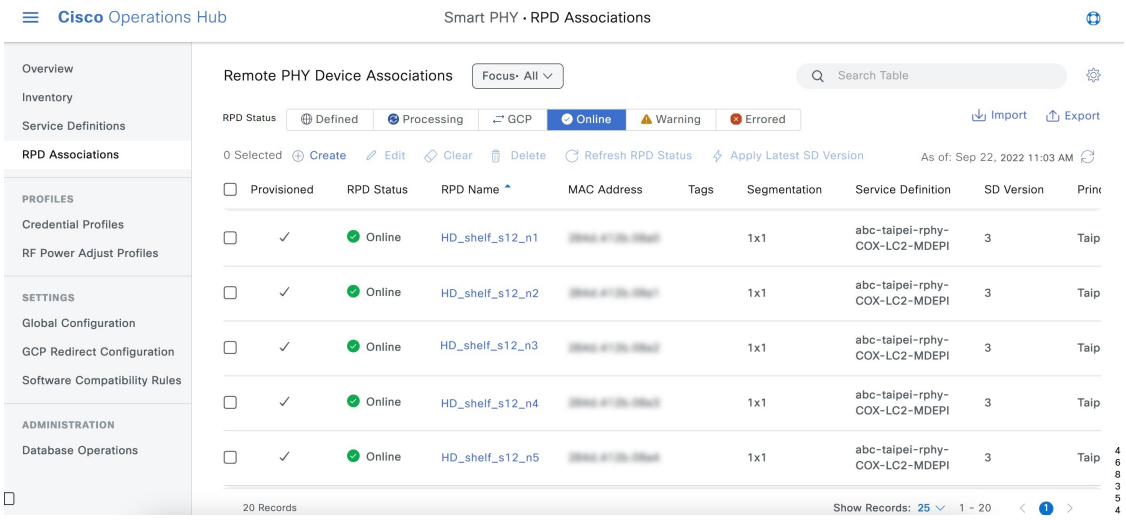
Field	Description
Node Segmentation	Select one of the following Node segmentation options: • 1x1 • 1x2 • 2x2 • 2x4
Service Definition	Select the Service Definition as created in the **Service Definitions** page. If Cisco Smart PHY does not manage the principal CCAP core and if the **Principal Core** field is empty, then the **Service Definition** field is optional.
RPD Association Policies	
Allow Shelf Specific Configurations	Select the check box to configure Cisco Remote PHY Shelf 7200, Cisco Remote PHY Shelf 300, or Cisco Remote PHY Shelf 600. Cisco cBR-8 routers running Cisco IOS XE Gibraltar 16.12.1z or later support this feature. Select this check box to enable the following fields: • **Base Power (dBmV)** • **Tilt Pivot Freq (Hz)** • **Tilt Slope (dBmV)** **Note** When RF parameters and Auxiliary cores are configured for Shelf RPDs, Base Power, Tilt Pivot Frequency and Tilt Slope values are automatically configured for Aux Cores. These values are derived from DOCSIS Principal Core. RPD does not restart after updating these parameters.
Enforce Compatibility with Cisco IOS XE 17.6.1	If you select this check box, then Smart PHY generates Cisco IOS XE Bengaluru 17.6.1 compatible controller configurations for Cisco cBR-8 routers running versions of Cisco IOS XE earlier than 17.6.1.
Service Definition Overrides	
Do not Apply Network Delay	If you select this check box, then Smart PHY does not apply the selected Service Definition's Network Delay configuration to this Association. If the Network Delay is configured in the selected Service Definition, checking this box impacts the service.
Override DSG Tunnel Group IDs	If you select this check box, Smart PHY overrides the selected Service Definition's DOCSIS Set-Top Gateway (DSG) Tunnel Group (TG) identifications list with the entries entered here. Seperate the entries must with a semicolon.
CCAP Cores & RF Parameters	
DOCSIS Principal Core	

Field	Description
Device Name	Select the name of the managed cBR-8 router or the unmanaged CCAP Core, which is the Principal CCAP Core for the RPD. If you choose a managed Principal Core, then the Core must provide the RPD with data and narrowband digital forward (NDF)/narrowband digital return (NDR) services. This core may also provide the following services: • Out-of-band (OOB) SCTE 55–1 • Video services: If there is no separate auxiliary Video Core.
Interface	If the Principal Core is a managed Cisco cBR-8 router, then select the DPIC interface used to deliver the data service. Leave this field empty if there is no Principal Core or if the Principal Core is unmanaged.
First and Second Logical DS/US Pairing	
RPD DS Port (Downstream Physical Port)	Select the Downstream RPD port of the logical pairing. The two options are `0` or `1`. Select `0` for the first pairing. This is not applicable to the second pairing for 1x1 or 1x2 node segmentation. You can select `0` or `1` for 2x2 and 2x4 node segmentation.
RPD US Port (Upstream Physical Port)	Select the Upstream RPD Port of the logical pairing. Depending on RPD Node segmentation (1x1, 1x2, 2x2, 2x4), the possible options are 0, 1, 2 and 3.
DS Service Group	Enter the name of the Downstream Service Group. All RPDs with the same data service group share the downstream controller for Data Service (Virtual Splitting for Data). This is not applicable to second pairing for 1x1 or 1x2 node segmentation.
US Service Group	Enter the name of the Upstream Service Group. Upstream data service group allows multiple RPDs to share the same upstream controller for upstream data traffic. Not applicable to second pairing for 1x1 node segmentation.
US Port Description	Enter a brief description for US Port, while creating and editing RPD operations. Based on RPD segmentation (1x1, 1x2, 2x2, 2x4), description can be set for all the upstream ports.
Out-of-band Core	
Device Name	Enter the 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. This field must match either the **DOCSIS Principal Core** or the auxiliary **Video Core**. Leave this field empty if the OOB 55–1 and NDF/NDR services are not used.
Interface	Select the DPIC interface to be used for out-of-band 55–1 and NDF/NDR service. If the OOB 55–1 and NDF/NDR services are not used, then leave this field empty.
Override OOB VOM & VARPD IDs	If you select this check box, then Smart PHY overrides the selected Service Definition's OOB Downstream & Upstream parameters (VOM ID, VOM Profile, VARPD ID, and VARPD Profile) with the values entered here.
Downstream VOM ID	OOB 55–1 Downstream Virtual out-of-band Modulator (VOM) Identification (ID). If you populate this field, it overrides the value in the Service Definition. Enter a value from 1 through 20.

Field	Description
Downstream VOM Profile	OOB 55–1 Downstream VOM profile. If you populate this field, it overrides the value in the Service Definition. Enter a value from 1 through 4294967295.
Upstream VARPD ID	OOB 55–1 Upstream Virtual Advanced Return Path Demodulator (VARPD) ID. If you populate this field, it overrides the value in the Service Definition. Enter a value from 1 through 32.
Upstream VARPD Profile	OOB 55–1 Upstream VARPD profile for first logical Downstream or Upstream (DS/US) pairing. If you populate this field, it overrides the value in 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, on page 24. Enter a value from 1 through 4294967295.
Second Upstream VARPD Profile	OOB 55–1 Upstream VARPD profile for second logical Downstream or Upstream (DS/US) pairing. If you populate this field, it overrides the value in 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, on page 24. Enter a value from 1 through 4294967295.
Video Core	
Device Name	Enter the name of the Cisco cBR-8 router, which is the auxiliary CCAP core for the RPD that provides video services. Leave this field empty if the principal core provides the video services.
Interfaces	Select the DPIC interfaces to be used for Video Services.
Video Service Groups	Video service group (VSG) names. Video is forwarded only in the downstream direction. Not applicable to second pairing for 1x1 or 1x2 node segmentation. Important**:**Cisco Smart PHY does not allow you to configure a VSG on a Downstream Port 1 (ds1) with `broadcast` keyword through the Cisco cBR-8 CLI. If you try to configure a VSG on a Downstream Port 1 (ds1) with `broadcast` keyword, then the CLI shows an error.Cisco Smart PHY maps a VSG to a video interface based on the order of the VSGs and interfaces if a VSG can map to more than one interface: • A VSG can map to more than one video interface if the video interface list includes both ports 0 and 2 or both ports 4 and 6 of one Cisco cBR-8 Series 8x10G Remote PHY Digital Physical Interface Card (CBR-DPIC-8X10G). • Cisco Smart PHY maps the first VSG to a matching Principal Core interface if present; otherwise, it maps the first VSG to the first matching video interface. • Cisco Smart PHY maps second, third, and fourth VSGs to the highest numbered matching video interfaces. Cisco Smart PHY reorders video interfaces and VSGs, so that a video interface that matches the Principal Core interface and the associated VSGs are listed first.
RF Parameters	

Field	Description
Base Power (dBmV)	Configure the base channel power level. Enter the value based on the type of RPD. • **Node RPDs: 20–22** • **Shelf RPDs: 24–61** If base power isn't provided by the Smart PHY, then application for Shelf RPDs, then a default value of 25 dBmV is set by cBR-8.
Tilt Pivot Freq (Hz)	Configure the frequency of the tilt pivot point. The valid range is 0–121800000. Tilt pivot point is the maximum frequency point where the Tilt Slope is applicable.
Tilt Slope (dBmV)	Configure the tilt slope. The valid range is 0–8.
RF Power Adjust Profile	You can override the RF Power Adjust Profile. This is optional. For more information, see RF Power Adjust Profile.
US Base Power RX (dBmV)	Configure Upstream RF Base Power level. The valid range is -20 to 40 dBmV.
Additional Cores	
Device Name	You can add additional unmanaged Cores to the GCP Redirect list by selecting them here. You can select multiple additional cores. You can configure multiple unmanaged Cores. If an unmanaged core is already selected as the **DOCSIS Principal Core**, it can't be configured again as an additional core. Thus, the unmanaged Principal Core and the unmanaged Additional Core fields are mutually exclusive. If a DOCSIS Principal Core supports dynamic addition of more Cores, then you can configure it through Smart PHY Global Configuration and avoid RPD reboot.
RPD Software	
Principal Core SSD Profile	If the Principal Core is a managed cBR-8 router, then you can use this option to set the Secure Software Download (SSD) profile ID. If the Principal Core is unmanaged or you do not wish to set the SSD profile ID, leave this field empty.

Figure 1: RPD Associations



RPD Associations

Creating an RPD Association

You can create Remote PHY Devices Associations from Smart PHY's RPD Associations page.

Procedure

Step 1 At the main menu, select **Smart PHY** > **RPD Associations**.

Step 2 Click **Create** to add a single RPD Association.

The **Creating Remote PHY Device Association** page displays.

Step 3 Enter the values to the fields as seen in Creating Remote PHY Device Association.

Step 4 Click **Save**.

Once created, you can quickly view RPD details by clicking on the RPD Name or View 360° action. In case of a *config push* and *config read* error while provisioning the RPD, you can select the **Try Again** option to retry the same operation without filling in the RPD provisioning parameters.

Meta data about an RPD Association including the date that the association was created, the user who created it, the date of its last modification, and the user who last modified it can be seen in the Meta Data section of the Associations tab on the **Device 360° view** panel.

What to do next

Note

- Starting with Cisco IOS XE Dublin 17.12.1w, the latitude, longitude, and location information (configured for an RPD using the Smart PHY Inventory page), gets pushed to the CCAP Core automatically during the RPD association process. The CLI format can be seen in the **RPD 360° view > RPD Config History** tab.
- Smart PHY does not automatically push the latitude, longitude, and location information for RPDs which are already configured, when corresponding c-BR8/CCAP is upgraded to Cisco IOS XE Dublin 17.12.1w or higher.

Table 4: Feature History

Feature Name	Release Information	Description
RPD latitude and longitude configured on aux-only core	Cisco Smart PHY, Release 25.2	Latitude & longitude is configured on managed principal core. Smart PHY does not configure RPD latitude & longitude on aux-only/video CBR.

Clearing an RPD Association

You can clear one or multiple Remote PHY Device association records from Smart PHY's RPD Associations page.

When you perform the clear operation, all provisioning related configuration parameters (Node Segmentation, Service Definition, CCAP Cores, etc.) are removed from the association record. Additionally, Smart PHY removes all relevant CLI configuration commands from CCAP cores previously associated with the now cleared record. The only values retained in a cleared association record are: RPD Name, MAC Address, and Description.

Procedure

Step 1 At the main menu, select **Smart PHY** > **RPD Associations**.

Step 2 Check the box that corresponds to your RPD association record, then click **Clear**.

Step 3 Review the warning message, then click **Clear** to proceed.

Deleting an RPD Association

You can delete one or multiple Remote PHY Devices Associations from Smart PHY's RPD Association page. When you perform the delete operation, Smart PHY removes all relevant CLI configuration commands from CCAP cores associated with the record before permanently deleing the association record. The only value that remains in the RPD Associations page after deletion is the RPD MAC Address.

Procedure

Step 1 At the main menu, select **Smart PHY** > **RPD Associations**.

Step 2 Check the box that corresponds to your RPD association record, then click **Delete**.

Step 3 Review the warning message, then click **Delete** to proceed.

Note

- If you delete an RPD association record when one or more of its associated CCAP Cores is in maintenance or offline mode, Smart PHY deletes the record. Smart PHY doesn't remove relevant CLI configuration commands from the associated CCAP Cores. At the end of the delete operation, we recommend that you manually review the CLI configuration of the relevant CCAP Cores. Any CLI configuration pertaining to the RPD in question should be manually removed.
- Once an RPD is added or modified, Smart PHY updates Creation Time, Last Modified Time, and information about the user who created or modified the RPD. The meta data is visible in **RPD 360°** page.

Refreshing RPD Status

You can refresh the status of Remote PHY Device from Smart PHY's RPD Associations page.

Procedure

Step 1 At the main menu, select **Smart PHY** > **RPD Associations**.

Step 2 Select an RPD and click **Refresh RPD Status** to refresh its status from the associated CCAP device.

Applying Latest SD Version

YYou can apply the latest version of Service Definitions to one or multiple Remote PHY Devices from Smart PHY's RPD Associations page.

Procedure

Step 1 At the main menu, select **Smart PHY** > **RPD Associations**.

Step 2 Select one or multiple RPDs.

Step 3 Click **Apply Latest SD Version**.

Creating RPD Associations in Bulk Through CSV Import

You can provision RPDs in bulk, using the **Import** option available in the **RPD Associations** page.

Procedure

Step 1 At the main menu, select **Smart PHY** > **RPD Associations**.

Step 2 Click **Import**.

Step 3 Choose a CSV file containing RPD Association records. Ensure that all the provisioning parameters are present in the CSV file.

Step 4 Import

Note
When you attempt to provision Data and Auxiliary services such as Video or OOB on two different cores, Smart PHY considers the operation as **atomic**. RPD is provisioned successfully when both Data and Auxiliary services are configured successfully. If it fails even in one of the cores, the entire operation is rolls back.

Task Viewer

Table 5: Feature History

Feature Name	Release Information	Description
Task Viewer Panel Enhancement	Cisco Smart PHY, Release 23.3	In the Task Viewer Panel, you can click an RPD in either the **Queued Tasks** tab or **Completed Tasks** tab to open the **RPD Panel**. The **RPD Panel** shows additional information about the selected RPD.
Task Viewer Panel	Cisco Smart PHY, Release 23.2	You can view the status of both queued and completed provisioning operations by opening Smart PHY's Task Viewer panel.

While most provisioning operations submitted to Smart PHY execute quickly, in some circumstances it may take Smart PHY several minutes, or even tens of minutes, to execute all pending operations. This is due to the asynchronous nature of RPD provisioning, which requires generating and then pushing CLI configuration commands to one, or more, managed cBR-8 routers.

Users can view the status of both queued and completed provisioning operations by opening Smart PHY's Task Viewer panel. To open the Task Viewer panel, click the Task List icon located in the top right corner of the Smart PHY WebUI, immediately to the left of the Support icon. By default, the Task Viewer panel opens with the **Queued Tasks** tab selected.

Queued Tasks

The **Queued Tasks** tab shows an ordered list of queued tasks that Smart PHY is either preparing to execute or actively executing.

The list includes the following information about each task:

- Date Initiated
- Task ID

- Operation (type)
- RPD Name
- CCAP Core Name
- Status (Preparing or Executing)

The user can filter the list by:

- Operation Type (Add, Remove, Modify)
- Status (Preparing, Executing)

A search field and export action are also available to the user. Once a task is executed, its result can be seen by clicking the **Completed Tasks** tab.

Completed Tasks

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The **Completed Tasks** tab shows a sorted list of completed tasks.

The list includes the following information about each task:

- Date Initiated
- Result
- Task ID
- Operation (type)
- RPD Name
- CCAP Core Name

The user can filter completed tasks by:

- Operation Type (Add, Remove, Modify)
- Result (Success, Fail)
- Date Initiated (Last 24hr, Last 7 days, Last 30 days, All Time)

A search field and export action are also available in the panel.

Task Details

Clicking a Task ID in either the Queued Tasks tab or Completed Tasks tabs opens the Task Details panel. The Task Details panel shows additional information about the selected task.

Depending on the operation type and result, the additional information could include:

- Initiator Username
- Initiator Method
- Operation Type
- RPD Name

- CCAP Core Name
- Date & Time Initiated
- Duration
- Result
- Reason (in case of an error)
- Pushed CLI Configuration (in case of success)

RPD Details

Clicking an RPD in either the Queued Tasks tab or Completed Tasks tabs opens the RPD Panel. The RPD Panel shows additional information about the selected RPD.

Depending on the operation type and result, the additional information could include:

- Description
- MAC address
- Vendor & Model
- RPD type
- Software Version
- Tags
- Status
- CCAP Core Summary
- Location

Service Definitions

Feature History

Table 6: Feature History

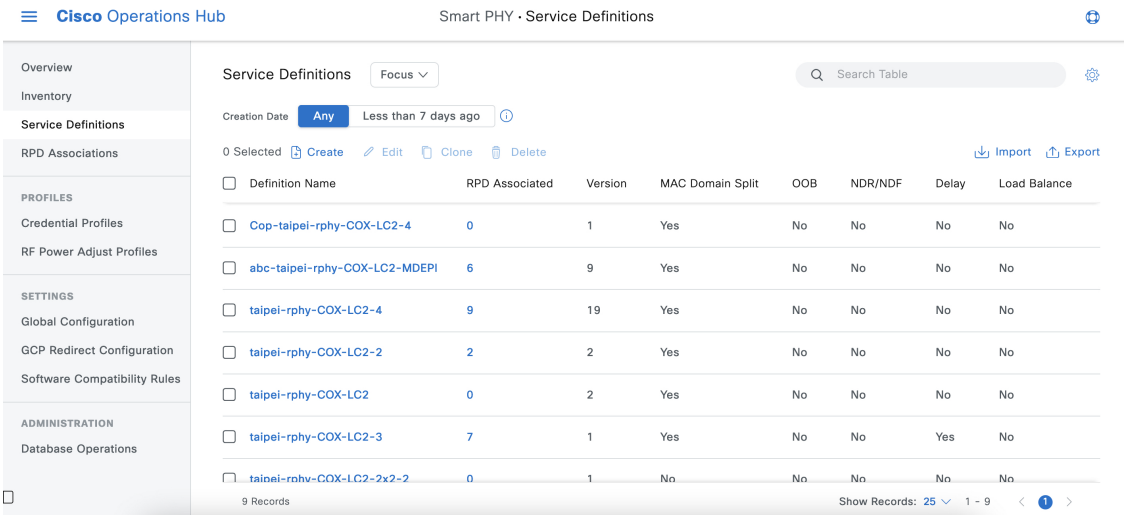
Feature Name	Release information	Description
Support for 2x4 RPD	Cisco Smart PHY, Release 24.1	Cisco Smart PHY supports 2x4 RPD configurationsin addition to 1x1, 1x2, and 2x2 RPD configurations.

Feature Name	Release information	Description
Service Definition Enhancement	Cisco Smart PHY 22.2	• **Service Definition Versions**: Service definition now provides versioning and enables you to track the Service Definition changes. This identifys the RPDs running specific versions of a Service Definition. • **Forced Config Push**: You can edit Service Definitions and push service impacting changes to RPD(s) using the Force Config push option. Smart PHY deletes and re-adds the RPDs automatically. • **RF Profile Overwrite**: You can overwrite the RF Power Adjust Profile during RPD provisioning.
Modernized and Refreshed Service Definition UI	Cisco Smart PHY 22.2	• Support to create, edit, and clone service definitions. • Support to bulk delete the service definitions. • Filter based on with assigned and without assigned RPDs. • Ability to view device information, configuration, and version details in the Service definition name link. Ease to edit or clone from **Service Definitions Details** page. Enhanced Search option based on service definitions configured. • Export service definitions from GUI. • Import a maximum of 500 service definition using CSV file. • Enhancement in table settings to edit the table columns and table appearance, and arrange the table columns as per requirement.
Apply Latest Service Definition Version	Cisco Smart PHY 22.3	You can assign the latest service definition to one or more RPDs in RPD Association page. Smart PHY handles service affecting changes smartly and reprovisions the RPDs in case service affecting changes are applicable in the latest version of the Service Definition.

Service Definitions are a logical grouping of the various configuration parameters that are needed to complete the RPD provisioning. You can manage Service Definitions on Smart PHY's **Service Definition** page.

When an RPD Association is created, or modified, the parameters that are configured in the selected Service Definition, are applied to the RPD.

Figure 2: Service Definitions



Creating Service Definitions

Procedure

Step 1 At the main menu, select **Smart PHY** > **Service Definitions**.

The **Service Definitions** page appears.

Step 2 Click **Create**. The **Create Service Definition** page displays.

Step 3 Fill the **Name**, **Description**, and **Tags** fields. If you have multiple Service Definitions, then enter concise, informative, and detailed descriptions for these fields.

Step 4 Check the **Default** check box to make this the default Service Definition for Smart PHY. This is optional.

Step 5 Enter the remaining Service Definition parameters listed in the following table. All fields that are not marked as optional, are mandatory. Cisco Smart PHY supports unique downstream (DS) and upstream (US) configurations for each port of RPD 2x2.

Table 7: Service Definition Parameters

Field	Description	Service Affecting Parameter
Name	Name of the Service Definition.	No
Description	A brief description about the Service Definition	No
Tags	New or previously created user-defined tags can be assigned to the Service Definition.	No
General Parameters		
Event Profile ID	RPD Event Profile Set.	No

Field	Description	Service Affecting Parameter
Remote DOCSIS Timing Interface ID	Remote DOCSIS Timing Interface (R-DTI) Set.	No
Pilot Tone Profile ID	Pilot tone profile.	Yes
Cable DSG TGs	DSG tag IDs.	Yes
Logical Pairings		
Split the MAC Domain	Check this box to have Smart PHY split the MAC Domain between two fiber nodes that share the same downstream controller. See Provisioning RPDs with MAC Domain Split, on page 22.	Yes
First Logical DS/US Pairing		
Service Group Profile	Pre-existing Cable Service Profile-Group on the Cisco cBR-8 router.	Yes
Downstream Controller Profile	Primary downstream CCAP controller profile.	Yes
RF Power Adjust Profiles	You can adjust the power for the downstream RF channels using RF Power Profiles.	No
Upstream Controller Profile	Primary upstream CCAP controller profile.	Yes
Second Logical DS/US Pairing		
Toggle Switch	Use this option to enable the second logical DS/US pairing. The Cisco Smart PHY application supports different controller profiles and fiber node configurations for second logical pairing in 2x2 and 2x4 RPDs.	Yes
Service Group Profile	Pre-existing Cable Service Profile-Group on the Cisco cBR-8 router.	Yes
Downstream Controller Profile	Secondary downstream CCAP controller profile.	Yes
RF Power Profiles	It allows you to adjust power for downstream RF channels using RF Power Profiles. For more information, see RF Power Adjust Profiles.	No
Upstream Controller Profile	Secondary upstream CCAP controller profile.	Yes
Network Delay		

Field	Description	Service Affecting Parameter
Type:	Two options are available: • **DEPI Latency Measurement**—The cBR-8 router periodically measures the network latency between itself and the RPD, and dynamically updates the cable map advance. Range is the interval that is measured in seconds. The valid range for measuring DLM is 1–420 seconds.*Measure only*—Choose to measure network latency between the CCAP core and the RPD. This option is not for updating the cable map advance. You can select this option for a service definition in use, but cannot uncheck it. • **Static**—The cable map advance is adjusted by a fixed amount. The valid range is 30–100,000 microseconds.This range is the Converged Interconnect Network (CIN) delay in microseconds. CIN is the network between the CCAP core and RPD. For more information, see *DEPI Latency Measurement in the Service Template* section in this document.	No
Out Of Band		
Out Of Band Downstream		
Virtual out-of-band Modulator ID	OOB 55–1 Downstream Virtual out-of-band Modulator (VOM) identification (ID).	No
Virtual out-of-band Profile	OOB 55–1 Downstream VOM profile.	No
Out Of Band Upstream		
Virtual Advanced Return Path Demodulator ID	OOB 55–1 Upstream Virtual Advanced Return Path Demodulator (VARPD) ID.	No
Port 0 Virtual Advanced Return Path Demodulator Profile	OOB 55–1 Upstream VARPD profile for first logical downstream/upstream (DS/US) pairing.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, on page 24.	No
Port 1 Virtual Advanced Return Path Demodulator Profile	OOB 55–1 Upstream VARPD profile for second logical downstream/upstream (DS/US) pairing.The upstream VARPD profile (upstreamVarpdProfile) and the second upstream VARPD profile (secondUpstreamVarpdProfile) can have the same value. For more information, see Common OOB 55-1 US Profile for Cisco RPD 1x2/2x2, on page 24.	No
Narrowband Digital Forward & Return		
Port	Choose Port 0, or Port 1.	No

Field	Description	Service Affecting Parameter
Pseudowire Name	ForwardNarrowband digital forward pseudowire name.Supports up to three pseudowire names and profile ID sets per DS port. ReturnNarrowband digital return pseudowire name. Supports up to three pseudowire names and profile ID sets per US port.	No
Profile ID	• NDF—NDF profile ID corresponding to the above NDF pseudowire. • NDR—NDR profile ID corresponding to above NDF pseudowire.	No
Load Balancing		
Text Field	Use the Cisco NSO Ntool to create a Load Balance group config-template encoded in XML. Enter the template in the text entry field.	No

Step 6 Click **Save** to save the information to Smart PHY or click **Save & Assign** to save the information and assign this Service Definition to one or more RPDs.

Note
Once Service Definition is created, you can see more parameters such as **Service Definition Version**, **Create**, **Update timestamp** and **Owner information** which is the user who created this Service Definition in the Service Definition page.

Viewing and Editing Service Definitions

Once you create a Service Definition, you can view and edit it anytime. You can view the Service Definition information after a service is created and associated with the RPDs.

- You can view the Service Definition information after a service is created and associated with the RPDs. For more information, see Viewing Service Definitions, on page 20.
- You can dynamically edit the parameters of a Service Definition including its name even when the RPDs are associated to service definitions. For more information, see Editing Service Definitions, on page 20.

Applying Latest Version of a Service Definition

Once a Service Definition is edited, you can apply its latest version to one or multiple RPDs from 'Assigned RPDs' tab of Service Definition Details panel. To assign the latest version:

1. At the main menu, select **Smart PHY** > **Service Definitions** and click a Service Definition name. The **Service Definition Details** panel.
2. Select **Assigned RPDs** from the **Service Definition Details** panel.
3. Identify and select the RPDs where the latest version needs to be configured.
4. Click **Apply Latest SD Version** to apply the latest Service Definition version.

Once the operation is successful, you can see the **LATEST** tag in the version column, confirming that the RPD running the latest Service Definition version.

Viewing Service Definitions

The procedure enables you to view service definition details in the **Service Definitions** page.

Procedure

	Command or Action	Purpose
Step 1	At the main menu, click **Smart PHY** > **Service Definitions**.	The **Service Definitions** page appears.
Step 2	Click any **Service Definition** to view the following details:	***Table 8: Service Definition Fields***

Field Name	Details
Overview	Displays the overview of the Service Definition and contains the version, description, tags, create time, last modification details, and RPDs Assigned.
Configurations	Displays the details of the various configuration parameters that are used in the Service Definition.
Assigned RPDs	Displays the list of RPDs assigned to that Service Definition.
Version History	Displays the history of the changes for a Service Definition in chronological order.

Editing Service Definitions

You can dynamically edit the parameters of a Service Definition including its name even when the RPDs are associated to service definitions. You can then apply the changes to one or more RPDs that are already running that specific service definition. If a Service Definition is edited, then its version gets updated and is visible in the Service Definition page.

Editing a Service Definition may affect the service particularly, when you want to apply the changes to RPDs. On the Smart PHY UI, if a flag is visible next to a Service Definition parameter, it signifies that it is a service impacting field. You may get `config push error` from the Cisco cBR-8 router and may have to reprovision the RPD. However, if you don't want to reprovision the RPDs, you can use the updated service definition parameters to provision new RPDs in the network. For more details, see Service Definitions, on page 14.

Also, if the Cisco cBR-8 router is in maintenance mode, you cannot propagate these changes to the RPDs. In these scenarios, configuration error messages appear in the **RPD 360** page.

This procedure edits a Service Definition.

Procedure

Step 1 At the main menu, click **Smart PHY** > **Service Definitions**.

The **Service Definitions** page appears.

Step 2 Select the service definition which you wish to update and click **Edit**.

Step 3 Update the required fields.

Step 4 Click **Save** or **Save & Assign**.

Note

- **Save** allows you to save the changes to the Cisco Smart PHY database.
- **Save & Assign** allows you to save the changes to the Cisco Smart PHY database and then recommends that you to apply the changes to one or more RPDs.

Once a service definition is updated, its version is incrementally updated and the changes are captured under **Version History**.

Cloning Service Definitions

You can create a new Service Definition by cloning an existing Service Definition. Cloning creates a copy of selected Service Definition, which you can edit. Cloning saves time if you only intend to make minor changes to an existing Service Definition.

Procedure

	Command or Action	Purpose
Step 1	At the main menu, click **Smart PHY** > **Service Definitions**.	The **Service Definitions** page appears.
Step 2	Select the check boxes of the Service Definitions that you wish to clone.	
Step 3	Click **Clone**.	The **Clone Service Definition** panel displays. The name of the cloned Service Definition is prefixed with **Copy-**.
Step 4	Edit the parameters that you wish to change and rename the Service Definition.	
Step 5	Click **Clone**.	

Provisioning RPDs with MAC Domain Split

Table 9: Feature History

Feature Name	Release Information	Description
MAC Domain Split and US Bonding Group Enhancements	Cisco Smart PHY, Release 24.1.1	In this release, we have updated the MAC Domain Split functionality in Smart PHY. The Modification affects the validations for US Bonding Groups in a Service Group Profile, where additional validations for US Channels are included in Service Group Profile.

You can enable **MAC Domain Split** from the **Service Definition** page if you want to split a Mac Domain between two Fiber Nodes that share the same downstream controller. See Creating Service Definitions, on page 16.

During RPD provisioning, when Mac Domain Split is enabled, Smart PHY Application fetches the upstream Channels that are not shut from the **US Controller Profile**, validates the US Channels that are associated with the **Service Group Profile** and then generates the Fiber Nodes and attaches those to a Remote PHY Device (RPD).

Note All Upstream Channels are not fetched, only validated Upstream Channels are fetched. Smart PHY validates and fetches the required Upstream Channels from **US Controller Profile** and maps them according to the service group profile definition.

Considerations and Expectations

1. Smart PHY considers *docsis-mode* to differentiate OFDMA and ATDMA channels.
2. Smart PHY considers the *shutdown tag* to detect whether a US channel is shutdown or not. Smart PHY does not perform any additional checks. For example, US frequency.
3. Smart PHY fetches the (validated) US Channels that are configured in the Upstream Controller Profile (except channels that are in shut down state). It filters and maps the same against the channels that are configured in the Service Group Profile.
4. Mapping between SG Channels in service-group profile and US Channels in US Controller profile does not exist in Smart PHY. The service group profile channel numbering must therefore adhere to the following rules:
   - The MAC Domain split must be at a controller level: 0–7 for one Fiber Node and 8–15 for another Fiber Node.
   - If the rule is not followed, an error displays.

5. MAC Domain split must be correct across the bonding groups. Ensure US Channels 0–7 stay on one Fiber Node and US Channels 8–15 stay on its peer Fiber Node. The US channels that are used in a bonding group can't cross the 0–7 and 8–15 channel boundary anytime.
6. RPD provisioning fails with a Config Push Error in a cBR-8 router, if there is a numbering mismatch for the SG Channels (including peer-node-us) in two Fiber Nodes that are shared between the same Downstream Cable.

Smart PHY Validations

1. Upstream Bonding Group is optional. If an Upstream Bonding Group exists, then the number of US Bonding Groups must be even.
2. The number of upstream channels in the Service Group Profile must be even.
3. One half of the US Channels present in the Service Group Profile can't be more than the number of "unshut" upstream Channels present in the US Controller Profile.

Provisioning an RPD for Video Support

Table 10: Feature History

Feature Name	Release Information	Description
Multi Core Atomic Provisioning	Cisco Smart PHY, Release 22.2	• Atomic transactions when multiple cores are involved. • Automatic rollback on transaction failure.
Support for two Video Core Chassis	Cisco Smart PHY, Release 23.1	Smart PHY supports the configuration of Video Services from more than one source chassis.

Cisco Smart PHY can be configured to use distinct Cisco cBR-8 routers as the DOCSIS Principal core and auxiliary video core.

The DOCSIS configuration is pushed to the Principal core and the video configuration is pushed to one or multiple Video Auxiliary cores. You can configure the OOB core to be either the Principal core or one of the Video Auxiliary cores. The OOB 55-1 and NDF/NDR configurations are pushed to the OOB core through the OOB core interface. You can configure only the Pilot tone, SSD, and DLM on the Principal core.

Important When integrating Viavi with RPD, NDF or NDR must be configured on the Principal Core. Viavi communicates with the core using SNMP MIBs that are only available on the Principal Core.

Cisco Smart PHY can also provision an RPD for supporting video using a standalone Cisco cBR-8 router or some other Core that is not managed by Cisco Smart PHY, as the Principal core.

If the principal core is not managed by Cisco Smart PHY and you do not have OOB 55–1 configuration on the auxiliary video core, the RPD Assignment does not require Service Definition configuration.

Note

- When you provision data and video services on two different cores simultaneously, Smart PHY considers it as an **atomic transaction**. In other words, an RPD is provisioned successfully when both data and video services are configured successfully. If the configuration of either core fails, then the entire operation is rolled back.
- When you provision data and video services on different cores at different point of time, each provisioning operation is considered as an independent transaction.
  - If RPD is online with both Principal Core and separate Video Auxiliary Core, and you remove the Video Core configuration, the RPD reboots and becomes online with only the Principal Core.
  - If the RPD is online with only the Principal Core, and later if you configure a separate Video Auxiliary Core, the RPD does not reboot automatically. You must manually reboot the RPD to get it to redirect to the new Video Core. After the RPD reboots, it becomes online with both cores.

Caution When you use the REST API to provision an RPD with separate video cores, you must use only version 2 (V2) RPD-pairing REST API. If you use V1 RPD-pairing API to provision an RPD with separate video cores, it may lead to data corruption. Also, version 1 (V1) of the RPD-pairing REST API does not support features such as 1x2 node segmentation, 2x2 node segmentation, OOB override, DLM, or separate video cores.

Common OOB 55-1 US Profile for Cisco RPD 1x2/2x2

The Cisco cBR-8 router supports configuring the same profile to both upstream physical RF ports in an RPD. Service providers can expand the OOB 55–1 service group on to the second US port without the need for extra hardware.

This feature is available only in the following versions of Cisco cBR-8 series routers:

- Cisco IOS XE Fuji 16.8.1 and earlier
- Cisco IOS XE Amsterdam 17.3.1x and later

Note When you provision data and OOB services on two different cores, Smart PHY considers it as an **atomic transaction**.

Example

```
cable rpd SAME_OOB_US_PROFILE
identifier 2222.5555.2323
core-interface Te6/1/2
principal
rpd-ds 0 downstream-cable 6/0/1 profile 1
rpd-us 0 upstream-cable 6/0/1 profile 1
rpd-us 1 upstream-cable 6/0/2 profile 1
core-interface Te6/1/2
rpd-ds 0 downstream-oob-vom 1 profile 100
rpd-us 0 upstream-oob-varpd 1 profile 101
rpd-us 1 upstream-oob-varpd 1 profile 101
r-dti 1
```

```
rpd-event profile 0
cable fiber-node 2
downstream Downstream-Cable 6/0/1
downstream sg-channel 0 23 downstream-Cable 6/0/1 rf-channel 0 23
upstream Upstream-Cable 6/0/1
upstream sg-channel 0 1 upstream-Cable 6/0/1 us-channel 0 1
upstream sg-channel 2 3 peer-node-us
service-group managed md 0 Cable 6/0/1
service-group profile ram_SG1
cable fiber-node 3
downstream Downstream-Cable 6/0/1
downstream sg-channel 0 23 downstream-Cable 6/0/1 rf-channel 0 23
upstream Upstream-Cable 6/0/2
upstream sg-channel 2 3 upstream-Cable 6/0/2 us-channel 0 1
upstream sg-channel 0 1 peer-node-us
service-group managed md 0 Cable 6/0/1
service-group profile ram_SG1
```

In REST API, the following restrictions are applicable:

- OOB is enabled only if the following four parameters are configured within the specified range:
  - downstreamVomId
  - downstreamVomProfile
  - upstreamVarpdId
  - upstreamVarpdProfile
- The NDF configuration is independent of the OOB downstream and upstream configurations.
- NDR configuration is independent of OOB downstream and upstream configurations.

REST set-service-template

```
{
  "autoAccept": false,
  "defaultFlag": false,
  "dlmMeasureOnly": false,
  "dsgTunnelGroupIDs": "1",
  "elementsList": [
    {
      "description": "Service profile with 1.5Gbps Data Service. 16x4 DS/US SG channels",
      "downstreamControllerProfile": 0,
      "downstreamVomId": 1,
      "downstreamVomProfile": 1,
      "eventProfile": 0,
      "mdSplitting": false,
      "rdtiConfig": 0,
      "serviceGroupName": "SGProfile",
      "serviceType": "Data",
      "svcNdfProfiles": [
        {
          "portNum": 0,
          "profileId": 100,
          "pwName": "name1"
        }
      ],
      "svcNdrProfiles": [
        {
          "portNum": 0,
          "profileId": 100,
          "pwName": "name1"
```

```
        }
      ],
      "upstreamControllerProfile": 0,
      "upstreamVarpdId": 1,
      "upstreamVarpdProfile": 1
    }
  ],
  "loadBalanceXml": "XML String",
  "name": "Gold",
  "networkDelayDlm": 10,
  "networkDelayStatic": "null",
  "pilotToneProfile": 0,
  "secondUpstreamVarpdProfile": 1
}
REST  get-service-template Response Content Type

{
  "autoAccept": false,
  "defaultFlag": false,
  "dlmMeasureOnly": false,
  "dsgTunnelGroupIDs": "1",
  "elementsList": [
    {
      "description": "Service profile with 1.5Gbps Data Service. 16x4 DS/US SG channels",
      "downstreamControllerProfile": 0,
      "downstreamVomId": 1,
      "downstreamVomProfile": 1,
      "eventProfile": 0,
      "mdSplitting": false,
      "rdtiConfig": 0,
      "serviceGroupName": "SGProfile",
      "serviceType": "Data",
      "svcNdfProfiles": [
        {
          "portNum": 0,
          "profileId": 100,
          "pwName": "name1"
        }
      ],
      "svcNdrProfiles": [
        {
          "portNum": 0,
          "profileId": 100,
          "pwName": "name1"
        }
      ],
      "upstreamControllerProfile": 0,
      "upstreamVarpdId": 1,
      "upstreamVarpdProfile": 1
    }
  ],
  "error": {
    "errorCode": "RecordNotFound",
    "errorMessage": "Record not found : <Record type> <identifier>",
    "errorTag": "Record not found",
    "errorType": "User"
  },
  "loadBalanceXml": "XML String",
  "name": "Gold",
  "networkDelayDlm": 10,
  "networkDelayStatic": "null",
  "pilotToneProfile": 0,
  "rpdsAssigned": 0,
  "rpdsProvisioned": false,
```

```
  "secondUpstreamVarpdProfile": 1,
  "status": "Success or Failure. If Failure check Error field for error details."
}
```

Configuring Video Services

You can configure video service in a Cisco cBR-8 router using Cisco Smart PHY by wiring the video interfaces and video service groups (VSG).

Cisco Smart PHY provides a clear mapping between VSG and video interfaces. RPD node segmentation determines the number of VSGs that you can choose for a video interface.

Prerequisites

Create video service groups (VSG) in the Cisco cBR-8 router, before you configure a video service for each RPD. There are two ways to create VSGs:

- Manual method(Recommended): Provide a logical name for the VSG. Example: `cable virtual-service-group 18528 downstream-video 1/0/8 profile 101`
- Automatic method: When you assign a controller to a Cisco cBR-8 router profile that has video services, Cisco cBR-8 creates a VSG with a random name.

For more information, see Cisco cBR Converged Broadband Routers Video Configuration Guide for Cisco IOS XE Cupertino 17.9.

Adding a New Video Interface

Use the following task to add a new video interface.

1. Click the main menu at the top-left of the home page, and select > **Smart PHY** > **RPD Associations**. The **Remote PHY Device Associations** page displays.
2. Click the **Create** button. The **Create Remote PHY Device Association** page displays.
3. Add single or multiple entries in the **Video Core Interface** and **Video Service Group** fields.
4. Click the **Save** button.

You can also import CSV files from the previous versions of the Cisco Smart PHY application which have video configurations. You can also import a database that is exported from a previous version of the Cisco Smart PHY application.

Configuring VSG Using API

You can configure VSG using the Cisco Smart PHY API `setrpdpairinglist`.

This API is backward compatible. It has an extra `videointerfaces` field under `port-config`. The existing video service group mapping with the video interfaces, remains without any changes.

Example: Sample RPD Pairing API

```
{
  "setrpdpairinglist": [
    {
      "name": "rpd03",
      "previousname": "rpd03",
      "macaddress": "00049f320825",
```

```
        "description": null,
        "approvalstate": "approved",
        "servicetemplate": "d8-sg-split-rdti1",
        "gpslocation": {
          "genericlocation": "",
          "latitude": "",
          "longitude": ""
        },
        "ssdprofileid": 1,
        "disablenetworkdelay": false,
        "preconfigure": true,
        "nodesegmentation": "rpd_1x1",
        "additionalcores": [
          "2004:172:30:0:2eab:a4ff:feff:f36c"
        ],
        "assignedcores": [
          {
            "servicetype": "data",
            "mgmtcore": "video-lwr-s-d8.cisco.com",
            "rpdconnectioninterface": "tengigabitethernet9/1/0",
          },
          {
            "servicetype": "video",
            "mgmtcore": "video-lwr-s-d8.cisco.com",
            "rpdconnectioninterface": "tengigabitethernet9/1/0",
          },
         {
            "servicetype": "video",
            "mgmtcore": "video-lwr-s-d8.cisco.com",
            "rpdconnectioninterface": "tengigabitethernet9/1/6",
          },
          {
            "servicetype": "oob",
            "mgmtcore": "video-lwr-s-d8.cisco.com",
            "rpdconnectioninterface": "tengigabitethernet9/1/0",
          }
        ],
        "portconfigs": [
          {
            "dsport": 0,
            "usport": 0,
            "dsservicegroup": "sg-9-0-0",
            "usservicegroup": "sg-upstream-9-0-0",
            "videoservicegroups": [
              "vsg1",  // Index 0 is read along with video interface index 0
              "vsg2",  // Index 1 is read along with video interface index 1
              "vsg3"  // Index 2 is read along with video interface index 2
            ],
            "videointerfaces":[
              "tengigabitethernet9/1/0", // Index 0 is read along with vsg index 0
              "tengigabitethernet9/1/6", // Index 1 is read along with vsg index 1
              "tengigabitethernet9/1/6" // Index 2 is read along with vsg index 2
             ]
          }
        ]
      }
    ]
  }
```

Limitations

- If you use the `setrpdpairinglist` API without the `videoInterfaces` attribute under `port-configs`, Cisco SmartPHY performs an ambiguity resolution. This process does not provide a clear one-to-one mapping.
- If two or more VSGs are configured under the same interface, the `videointerfaces` must repeat to match the one-to-one mapping.
- If you do not add the video interfaces under port-config and the assigned-cores, then the application shows an error.
- The size of the list of video interfaces and the VSGs must be the same.
- You can only map a VSG to a single interface. However, you can map the VSG to the same interface in a different port.
- If you configure a video interface without mapping to a VSG, then the application ignores the video interface.

Video Static Pseudo-wires for Broadcast

Table 11: Feature History

Feature Name	Release Information	Description
Video Static Pseudo-wires for Broadcast	Cisco Smart PHY, Release 25.1	With this release Smart PHY supports the configuration that is required for the cBR-8 feature - Video static pseudo-wires for Broadcast. This Feature: • enables a more manageable broadcast maintenance environment by reducing the number of cBR-8 devices that are needed for broadcast video traffic. • improves the overall efficiency, scalability, and manageability of the video core setup • enables effective utilization of the same multicast video content by streamlining the broadcast video traffic processing.

Video Static Pseudo-wire enables a more manageable broadcast maintenance environment by reducing the number of cBR-8 devices that are needed for broadcast video traffic. With one multicast video traffic source, all cBR-8 devices can utilize the same multicast video content, streamlining broadcast video traffic processing and reducing redundancy. This feature addresses the issues of unnecessary duplication, wasted processing power, and inefficient utilization of network resources caused by each cBR-8 independently generating its own copy of the broadcast video stream. It also separates video cores for narrowcast and broadcast functionalities.

Benefits of Video Static Pseudo-wires for Broadcast

- Reduces the number of CBR8 devices that are needed for broadcast video traffic.
- Streamlines broadcast video traffic processing.

- Reduces redundancy in video processing.
- Enables a more manageable broadcast maintenance environment.
- Improves utilization of network resources.

Configuration Overview

Here is a sample configuration for video static pseudo-wires for broadcast:

```
cable rpd RPD01
 identifier 0027.900b.0dc6
core-interface Te6/1/0
  principal
  rpd-ds 0 downstream-cable 6/0/0 profile 223
  rpd-us 0 upstream-cable 6/0/0 profile 225
  rpd-us 1 upstream-cable 6/0/0 profile 225
 core-interface Te6/1/2
  rpd-ds 0 static-pseudo-wire-video <name or id> profile 240
 r-dti 1
 rpd-event profile 0
 rpd-55d1-us-event profile 0
```

Controller Profile Configuration

```
cable downstream controller-profile 105 SPW-Video
 spw-source-ip 10.1.1.1
 max-carrier 158
 rf-chan 1
  type VIDEO ASYNC
  qam-profile 0
  rf-output NORMAL
  spw-dest-ip 225.1.1.1
  spw-session-id 0x2332
```

Secure Software Download for RPD

Table 12: Feature History

Feature Name	Release Information	Description
Configure Maximum Retries for RPD SSD Operations	Cisco Smart PHY, Release 24.2	With this release, you can configure the maximum number of Smart PHY's failed consecutive SSD operations and also configure the duration between the retry attempts. Enabling this feature allows you to manually configure and provide better control of the retry attempts and duration, instead of the default indefinite duration and retry attempts.
Support for Using a Wildcard Character in the RPD Vendor and RPD Model Names	Cisco Smart PHY, Release 24.1	When you create an SSD Profile, you can use a Wildcard character when you input the RPD Vendor and RPD Model names.

Feature Name	Release Information	Description
RPD Secure Software Upgrade Enhancements	Cisco Smart PHY, Release 23.3	In this release: • Smart PHY SSD Profiles support the inclusion of an RPD Model. In previous Smart PHY releases, only the RPD Vendor is supported. • Software Compatibility Policies support attaching more than one Smart PHY SSD Profile. • The **History tab** in the **Secure Software Download** page is enhanced to include more information about each Smart PHY initiated SSD operation.
RPD Secure Software Upgrade	Cisco Smart PHY, Release 23.2	You can upgrade Remote PHY Device (RPD) from Smart PHY using the Secure Software Download (SSD) mechanism.

You can upgrade Remote PHY Device (RPD) from Smart PHY using the Secure Software Download (SSD) mechanism. To configure RPD software upgrades or downgrades, create SSD profiles and Software Compatibility Policies in Smart PHY. During RPD boot up phase (that is, GCP initialization), Smart PHY refers to these policies and triggers RPD upgrade using SSD IRA.

Creating SSD Profiles

You can control the RPD software that is deployed in the network by creating SSD profiles. Use the following steps to create a profile:

1. At the Main Menu, select on **Smart PHY > Secure Software Download**.
2. Click **Create SSD Profile** An SSD profile captures the following information.

Table 13: Create SSD Profile Fields

Name	Description
SSD Profile Name*	Name of the SSD profile
Make this a catch-all profile check box	A Catch-all SSD profile is used to ensure RPDs, that wouldn't otherwise be eligible for Smart PHY initiated SSD operations, are running a specific software image.
Enforce this catch-all profile switch.	This switch only applies to Catch-all SSD profiles. By default, the switch is off. When the switch is on, eligible RPDs that match the Catch-all SSD profile's criteria are instructed to execute an SSD operation.
RPD Vendor*	Name of the RPD Vendor. You may use a wildcard (*) character in the input. For Example: Cisc, Cisc*, NewVendor, NewVendor*
RPD Model	Model of the RPD. You may use a wildcard (*) character in the input. For Example: EN*, EN-*, 7306, GSK*
Transport*	TFTP or HTTP used to download RPD software image.

Name	Description
File Server IP Address or Hostname	Hostname or Server where the RPD Software (image) is available.
File Path	Directory path to the image file
File Name*	Name of the File
Manufacturer CVC	Manufacturer CVC chain to enable the RPD to download the code file from the download server
Cosigner CVC	Cosigner CVC chain to enable the RPD to download the code file from the download server

Note * indicates a mandatory field.

Editing and Deleting SSD Profiles

Once an SSD profile is created, you can edit and delete the SSD profile anytime. However, a profile which is associated with a Software Compatibility policy cannot be deleted till it is removed from the associated policy.

Rules for Upgrading RPD

Table 14: Rules for Upgrading RPD

Priority	Rule	Upgrade RPD
1	cBR-8 SSD Profile added for RPD	No
2	Exempt Flag set for RPD in Smart PHY Inventory page	No
3	Smart PHY SSD Profile added for RPD	Yes, when the condition is met
4	Smart PHY SSD Compatibility Policy applied to RPD's DOCSIS Principal Core	Yes, when the condition is met
5	Smart PHY SSD Profile marked as "Catch-All"	Yes, when the condition is met
6	None of the previous conditions are met	No

Creating Software Compatibility Policies

Once an SSD profile is created, it must be enforced to control the RPD software being deployed. Multiple SSD profiles can be attached to a Software Compatibility Policy. In a Smart PHY cluster, multiple policies can be active at any given point.

Restrictions

- Catch-all SSD profiles cannot be attached to a Software Compatibility Policy.

- SSD Profiles with matching RPD vendor names, but differing RPD software images cannot be attached to the same Software Compatibility Policy.
- SSD Profiles with matching RPD vendor names and RPD models, but differing RPD software images cannot be attached to the same Software Compatibility Policy.

A Software Compatibility policy contains the following information.

Table 15: Software Compatibility Policy

Name	Description
Policy Name	Name of the Policy.
Enforce Flag	To enforce a policy. Can be enforced during creation time or at a later time.
Cisco IOS-XE Software Version	Version of a CCAP core.
SSD Profile Name	The SSD profile which must be enforced.

Editing & Deleting Software Compatibility Policy

Once a Software Compatibility Policy is created, you can edit, enforce, and delete the SSD policy, anytime.

SSD History

The **SSD History** tab captures the list of RPDs upgraded from Smart PHY.

Exempting Smart PHY Initiated SSD Operation

You can exempt RPDs from Smart PHY initiated SSD operations by editing the RPD's Inventory record.

1. At the Main Menu, select on **Smart PHY > Inventory**.
2. Select the RPD to be exempted.
3. Click the check box, **Exempt from Smart PHY Initiated SSD Operations**.

As long as an RPD is marked as exempt, Smart PHY never instructs it to perform an SSD operation.

Configuring Maximum SSD Retries

You can configure the maximum number of retries for failed consecutive RPD SSD operations. Enabling this feature ensures that the RPD stops after the configured number of retries and resumes again once the time elapsed is met.

1. At the Main Menu, select on **Smart PHY > Global Configuration**
2. Select the *Enable RPD SSD Max Retry* toggle switch to enable RPD SSD maximum retries.
3. Configure the following fields:
   - **Number of attempts**: Set the maximum number of SSD requests initiated from SmartPHY to RPD Devices for a specific duration. The valid Range is 4–50 attempts.
   - **Set the Retries Elapsed Time**: Set the duration between SSD retry attempts(Retry is performed after the initial number of attempts are exhausted). The valid Range is 1–24 hours. For example, if

the **Set the Retries Elapsed Time** is configured as 4 hours and the SmartPHY has reached the maximum **Number of attempts**, then SmartPHY waits for 4 hours before reattempting SSD operations.

Note Disabling the *Enable RPD SSD Max Retry* toggle switch ensures that the RPD's perform SSD operations indefinitely without any restrictions until a successful or change in the SSD profile criteria.

cBR-8 Configuration Reconciliation

Feature History

Table 16: Feature History

Feature Name	Release information	Description
cBR-8 Configuration Reconciliation Enhancements and Reporting Enhancements	Cisco Smart PHY, Release 24.1	Smart PHY's cBR-8 configuration reconciliation logic is enhanced. You can trigger reconciliation for multiple cBR-8 simultaneously and perform reconciliation on one or more selected RPDs for a cBR-8 router. You can also reconcile 2x4 RPDs. We have added enhanced reporting functionalities to review deviation and reconciliation actions offline.
cBR-8 Configuration Reconciliation Logic Enhancements	Cisco Smart PHY, Release 23.3	Smart PHY's cBR-8 configuration reconciliation logic has been enhanced to include: Downstream RF Power Adjust values and RPD MAC Address. Additionally, Smart PHY's reconciliation error handling is improved and new reporting capabilities are added.
Enhanced Config Reconciliation Logic	Cisco Smart PHY, Release 23.2	In this release, we have enhanced reconcile logic to include additional parameters for Principal, OOB, and Video cores.
cBR-8 Configuration Reconciliation enhancements	Cisco Smart PHY, Release 23.1	You can perform Smart PHY Reconciliation using Smart PHY WebUI.
cBR-8 Configuration Reconciliation	Cisco Smart PHY, Release 22.2	You can now detect the configuration mismatches between the cBR-8 router and Smart PHY cluster. This helps in reconciling the configuration between both the entities so that the configuration set are in sync with each other and eliminates the need of reprovisioning of RPDs effectively and saves time.

Post upgrading the software on the CBR-8 router, the CBR-8 software automatically converts its earlier CLI configuration syntax into a new form on the CBR-CCAP-LC-G2-R line card. Ambiguity and differences may

be seen between the actual configuration in the cBR-8 router and the corresponding configuration that is stored in the Smart PHY cluster.

Manual changes to the RPD Association configuration directly performed on a cBR-8 device, can also result in configuration differences.

The Smart PHY reconciliation feature intelligently detects such configuration mismatches and updates its internal configuration. This reconciliation helps in maintaining the cBR-8 and Smart PHY configuration to be in sync and avoids reprovisioning of RPDs. During such reconciliation process, which can be triggered when cBR-8 transitions from maintenance to normal mode, Smart PHY takes care of the following aspects:

1. Detects the configuration differences and prepares a report of the configuration difference between cBR-8 and Smart PHY.
2. Updates the Resource Allocation information and CLI details in Smart PHY when there is any discrepancy.
3. Ensures that existing RPDs are not reprovisioned and the new RPDs use the correct set of resources.

Note In Smart PHY, the reconciliation feature assumes that the RPDs are configured with the same name in both Smart PHY and the cBR-8 router.

Smart PHY Reconciliation Operation

Use the following procedure to perform a Smart PHY Reconciliation Operation.

1. At the main menu, select **Smart PHY > Inventory**. The **Remote PHY Devices & CCAP Cores** page displays.
2. Select one or multiple CCAP routers, and from the **Managed CCAP Actions** drop-down list, click **Check for Config Deviation**. Smart PHY triggers a check to detect config deviation. This process may take a few minutes to complete.
3. If a config deviation is found, you can view the configuration difference and get an option to reconcile the data.
4. Click **Save to Smart PHY** to reconcile the Smart PHY database. During reconciliation, the Smart PHY database is updated with the configuration data from the selected CCAP.
5. You can download the reconciliation report by clicking the **Download Deviation Report** button.

Smart PHY Reconciliation using Maintenance Mode

Use the following procedure to perform Smart PHY Reconciliation using Maintenance Mode

1. At the main menu, select **Smart PHY > Inventory**. The **Remote PHY Devices & CCAP Cores** page displays.
2. Select the check boxes of one or more cBR-8 routers that are in the maintenance mode.
3. From the **Managed CCAP Actions** drop-down list, click **Resume Maintenance Mode**.
4. Review the Warning message and select the **Reconcile cBR-8 configuration** check box. The reconciliation operation takes place. The CCAP core is moved out of the maintenance state and reconciliation is performed.
5. Click **Resume Normal Operation**.

Reconciliation can be performed only for a single cBR-8. The following table shows the RPD Attributes that are reconciled.

Attribute	Reconciliation Status
RPD Device Name	Not Applicable as this attribute is the identifier for reconciliation
RPD Description	Reconciled
RPD MAC	Reconciled
Tags	Not Applicable as this attribute isn't a cBR-8 or RPD property
Node Segmentation	Reconciled
Service Definition	Not reconciled
Principal Core	
Device name for principal core	Not reconciled as we're triggering from cBR-8
Principal core interface	Reconciled
Downstream port 0	Reconciled
Upstream port 0	Reconciled
Downstream port 1	Reconciled
Upstream port 1	Reconciled
US Service Group for both ports	Reconciled
DS Service Group for both ports	Reconciled
US port 0 Description	Reconciled
US port 1 description	Reconciled
US base power for port 0	Reconciled
US base power for port 1	Reconciled
1st pairing downstream RF Pwr Adj profile	Reconciled
1st pairing DS base power	Reconciled
1st pairing tilt freq	Reconciled
1st pairing tilt slope	Reconciled
2nd pairing downstream RF Pwr Adj profile	Reconciled
2nd pairing DS base power	Reconciled
2nd pairing tilt freq	Reconciled
2nd pairing tilt slope	Reconciled
SSD Profile	Reconciled
Video Core Interface	
Video core Interface	Reconciled
VSG	Reconciled

Attribute	Reconciliation Status
OOB	
OOB interface	Reconciled
OOB parameters if overwritten	Reconciled
OOB parameters if overwritten for port 2	Reconciled

Note Once a cBR-8 router is reconciled, Smart PHY automatically updates the Last Modified Date and Last Modified By (user) meta data values.

Smart PHY Reconciliation Reports

When you perform configuration reconciliation, you have an option to view reports. Reports are available during the *check for config deviation* phase and as part of the post config reconciliation action. Reports are useful when you want to review and compare details offline.

Use the following steps to download Reconciliation Reports

1. At the main menu, click **Smart PHY > Inventory**. The **Remote PHY Devices & CCAP Cores** page displays.
2. Select the check box for an RPD for which you must check the configuration deviation. Click **Check for Config Deviation** under **Managed CCAP Actions**. A banner displays the status of the deviation from Spart PHY. The status can indicate if the Smart PHY's configuration is reconciled, partially reconciled or if the configuration deviates from Smart PHY.
3. If the RPD's configuration, deviates from Smart PHY, Click **Reconcile**. The **Configuration Reconciliation** panel displays.
4. At the bottom right you can either click **Download only Deviations**(if you only need the deviation report) or click **Download Full Report** (if you only need the full report). The full report contains all the RPDs under the span of the control of the selected CCAP Core.
5. The report (in PDF format) is downloaded.

Once the reconcile action is performed and the Smart PHY database is updated with the latest configuration from the CCAP core, you can download four different types of reports.

1. Full reconcile report, capturing all the RPDs for the selected CCAP core along with the result of the reconciliation action.
2. Success report capturing RPDs, where reconcile performed successfully.
3. Failure report capturing RPDs where reconcile action was executed but failed. The failure reason would be mentioned in this report.
4. Report capturing RPDs where reconcile action was skipped. Smart PHY skips reconciliation when RPDs are not configured properly end to end or not available either on Smart PHY or in CCAP Cores.

For More information about the RPD attributes, see Remote PHY Device Association, on page 4.

Table 17: Feature History

Feature Name	Release Information	Description
Display the Service Definition version in the reconciliation report	Cisco Smart PHY, Release 25.2	The Reconciliation reports display a deviation after Service Definition config is modified but not applied (use Save instead of Save and Assign) as reconciliation is comparing cBR-8 config with the latest Service Definition. version and not the SD version currently applied to RPDs. With this feature the reconciliation report now displays RPD associated with its version as well as the latest version of Service Definition. In previous Cisco Smart PHY releases, scripts were used to detect inconsistent Smart PHY DB tables data but fixing the inconsistent data was not possible.

Here is a sample reconciliation report displaying the latest service definition version:

```
RPD Name : RPD-TEST-1
Deviation Check Result :
Additional Information : RPD has config deviation with cBR-8. RPD is
associated with Service Definition S1, version 3, while the latest
version of Service Definition is 4

cable rpd RPD2
description test
description from cBR-8
identifier 7888.bb88.d8dO
type shelf
```

Support for Smart PHY to CCAP cBR-8 reconciliation

Table 18: Feature History

Feature Name	Release information	Description
Support for Smart PHY to CCAP cBR-8 reconciliation	Cisco Smart PHY, Release 25.2	In previous Cisco Smart PHY releases, reconciliation is only supported from the cBR-8 to Smart PHY direction. This feature provides reconciliation capabilities from Smart PHY to cBR-8.

In this release we have introduced a new direction Save to CCAP, which updates cable rpd and cable fiber-node configuration present in cBR-8. You can one or multiple RPDs or choose all RPDs for the core.

1. At the main menu, select **Smart PHY > Inventory**. The **Remote PHY Devices & CCAP Cores** page displays.
2. Select the checkbox next to the required device next to the **Status** column, hover over the eye icon and click **Reconcile**. The **Configuration Reconciliation** page displays.
3. In the **Configuration Reconciliation** page, select the **Reconciliation Direction: Smart PHY → CCAP** tab. You can select one or more RPDs to reconcile and click **Save to Smart PHY**.
4. You can download the reconciliation report by clicking the **Download Deviation Report** button.

This table displays the possible scenarios while saving to CCAP

Table 19: Possible scenarios while saving to CCAP

RPD present in Smart PHY	RPD present in cBR-8	Behavior
Present	Present	• In case of no deviation, RPD is not listed. • If the deviation is non-service impacting, then the configuration is pushed. • In case of service impacting deviations, reconciliation cannot be performed. On clicking Save to CCAP, reconciliation for the RPD is marked as **Failed**.
Present	Missing	RPD is pushed if the RPD is in **configured** or the above state in Smart PHY.
Missing	Present	RPD is deleted from cBR-8

RPDs with service impacting changes are not pushed to cBR-8 to ensure no service outage occurs.A Warning icon with a tool tip is displayed to indicate RPDs with service impacting changes. If you click on Save to CCAP in such scenarios, the Reconcile Result for the RPD is marked as failed.

Reconciliation always happens for one selected core at a time. For RPDs with multiple cores. A '+' icon is shown next to the RPD name to indicate there are different cores are present for the RPD.

Save to CCAP – Peer RPDs and LC switchover

- When an RPD is selected from a peer group, all RPDs, which shared the fiber-node are selected.
- When an RPD is configured on an interface, which is in LC switchover mode then reconciliation cannot be performed.

Viewing RPD History

Procedure

Step 1 Click the main menu at the top-left of the home page, and select **Smart PHY** > **RPD Associations**. The **Remote PHY Device Associations** page displays.

Step 2 Click the desired **RPD Name** to view the RPD information.

Step 3 Click **Status History** and **RPD Config History** to view the historical information.

Managing RF Power Adjust Profiles

Feature History

Feature Name	Release information	Description
RF Power Adjust Profile Enhancement	Cisco Smart PHY, Release 22.2	You can overwrite the RF Power Adjust Profile during RPD provisioning.

Smart PHY allows you to adjust the power levels for a single or a group of downstream RF channels using an RF Power Adjust Profile. An RF Power Adjust Profile consists of a profile name, an RF channel identifier (or identifiers), and a power adjust value. You can manage RF Power Adjust Profiles from Smart PHY's RF Power Adjust Profiles page.

RF channel power adjustment does not affect the service of the RPDs.

Limitations for RF Power Adjust Profile

- You cannot delete an RF Power Adjust Profile that is already used in a Service Definition.
- If you modify an RF Profile, the updated configuration is not applied to the RPDs that have already been provisioned. You can access the appropriate **Service Definition** page, select **Save & Assign**, select the specific RPD, and click **Assign** to apply the modified RF Power Adjust Profile parameters.

Creating an RF Power Adjust Profile

This procedure creates an RF power adjust profile.

Procedure

Step 1 At the main menu, select **Smart PHY** > **Profile** > **RF Power Adjust Profiles**.

The **RF Power Adjust Profiles** page displays.

Step 2 Click **Create**.

The **RF Power Adjust Profiles** page appears.

Step 3 Enter values for the following fields in the **RF Power Adjust Profiles** page.

Table 20: RF Power Adjust Profiles

Field	Value
Profile Name	Profile name can be up to 21 alphanumeric characters
Power Adjust (dBmV)	The Power Adjust range is from –10 to 10 dBmV

Field	Value
RF Channel	The RF Channel ID can be: • A single RF channel (for example: 6) • Multiple RF channels (for example: 6, 12, or 14) • Multiple consecutive RF channels (for example: 15–20) • A combination of the previous items (for example: 6.12, or 15–20)

Step 4 Click **Create**.

KOBOL US Scaling Support

Table 21: Feature History

Feature Name	Release Information	Description
KOBOL US Scaling Support	Cisco Smart PHY, Release 25.1	With this release, Smart PHY supports KOBOL US scaling features on the Gen2 (KOBOL) linecard including • increasing max OFDMA blocks per Gen2 LC from 32 to 64. • increasing max ATDMA channels per Gen2 LC from 256 to 512.