Cisco Remote PHY PowerKEY VOD

PowerKEY Video-on-Demand refers to video content that is chosen by the subscriber and streamed specifically to the subscriber. The content is encrypted using PowerKEY conditional access through a video session that is created on the line card in R-PHY mode on Cisco cBR-8, specifically for each request.

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

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Hardware Compatibility Matrix for Cisco Remote PHY Device

Note Unless otherwise specified, the hardware components introduced in a given Cisco Remote PHY Device Software Release are supported in all subsequent releases.

Table 1: Hardware Compatibility Matrix for the Cisco 2x2 Remote PHY Device

Cisco HFC Platform	Remote PHY Device
Cisco GS7000 BAU	Cisco 2x2 RPD Software 2.x and Later Releases Cisco Remote PHY Device 2x2 PID—RPD-2X2=

Information About PowerKEY VOD

The line cards in R-PHY mode on Cisco cBR-8 supports session-based PowerKey VOD. In both RPHY and integrated modes, the Cisco cBR-8 router establishes a GQI Remote Procedure Call (RPC) connection to the Edge Resource Manager (SRM), which may be an Explorer Controller (EC), USRM, or any other session manager. The Cisco cBR-8 supports 40G-R line cards, which can be configured for RPHY.

Configure the PowerKey VOD carriers in a GQI protocol LED. The Virtual Carrier Groups (VCG) in the LED, must be bound to a Service Distribution Group (SDG) with downstream-cable ports (instead of the integrated-cable ports).

Overview of PowerKEY VoD

PowerKEY VOD allows the operator to provide secure, encrypted video streams to a particular subscriber over the RF plant. PowerKEY video-on-demand is used in a Cisco cable environment to provide edge-encrypted video-on-demand movies and other content to subscribers. A subscriber can select the content through an on-screen selection and the set-top box (STB) notifies the head-end of the request.

The head-end equipment receives the request from the STB and triggers the Session Resource Manager (SRM) to create an encrypted video session on the Cisco cBR-8. At the same time, the video streamer is triggered to begin streaming the content in a UDP stream to the Cisco cBR-8. The Cisco cBR-8 receives an unscrambled video content, encrypts it using PowerKEY, combines the scrambled stream with other content intended for the RF carrier into a Multi-Program Transport Stream (MPTS), encapsulates it using R-DEPI protocol, and sends it out on Ethernet port to the Converged Interconnect Network (CIN) between the cBR-8 RPHY core and the RPHY Device (RPD).

How to Configure RPHY PowerKey VOD

Configuring the Encryption Type on the Line Card

The Cisco IOS-XE supports PowerKey encryption CA systems, but allows only one encryption type to be installed on the line card. There are two levels in the CA system. The lower level scrambler, which encrypts the actual data streams and the upper level conditional access system, which handles how the control words are transferred from the encrypting device to the decrypting device.

To specify the type of encryption used to scramble the data streams, complete the following procedure:

```
configure terminal cable video encryption
linecard slot/bay ca-system [powerkey] scrambler scrambler-type
exit
```

PowerKey currently supports DES type of encryption.

Verifying the Encryption Configuration

To verify the encryption type of a line card, use the show cable video encryption linecard command as shown in the following example:

```
show cable video encryption linecard 7/0
Line card: 7/0
```

```
CA System Scrambler
================================
powerkey des
```

Configuring the Encrypted Virtual Carrier Groups

For the sessions to be encrypted on the Cisco cBR-8, the Virtual Carrier Groups (VCGs) must be specified as encrypt and the line card must be configured as encrypted. In this way, the operator can choose the carriers on the line card that support encryption and other carriers that support only clear or pre-encrypted sessions. Each encrypted carrier consumes an encrypted carrier license.

For the VCG to be used in a Logical Edge Device (LED) that is configured with the GQI protocol, each RF carrier must be assigned with an output port number. The LED must be configured with the Generic QAM Interface (GQI) protocol in order to support session-based operation.

Note For PowerKEY VOD, you have to specify the session-based operation.

To configure the VCG, complete the following procedure:

```
configure terminal cable video
virtual-carrier-group vcg-name
encrypt
rf-channel channel range tsid tsid range output-port-number port num range
exit
```

Configuring the Encrypted Virtual Carrier Groups

For the sessions to be encrypted on the Cisco cBR-8, the Virtual Carrier Groups (VCGs) must be specified as **encrypt** and the line card must be configured as encrypted. In this way, the operator can choose the carriers on the line card that support encryption and other carriers that support only clear or pre-encrypted sessions. Each encrypted carrier consumes an encrypted carrier license.

For the VCG to be used in a Logical Edge Device (LED) that is configured with the GQI protocol, each RF carrier must be assigned with an output port number. The LED must be configured with the Generic QAM Interface (GQI) protocol in order to support session-based operation.

Note For PowerKEY VOD, you have to specify the session-based operation.

To configure the VCG, complete the following procedure:

```
configure terminal
cable video
virtual-carrier-group vcg-name
rf-channel channel range tsid tsid range output-port-number port num range
virtual-edge-input ip-address [vrf] vrf name input-port-number number
encrypt
exit
```

Verifying the Encrypted Virtual Carrier Groups Configuration

To verify the encrypted VCGs configuration, use the **show cable video virtual-carrier-group name** command as shown in the example below:

```
show cable video virtual-carrier-group name vod-grp
```

Configuring the Service Distribution Groups and Binding

The Service Distribution Group (SDG) is a collection of one or more RF ports and defines the physical slot/bay/port to be used in a video service. After you configure an SDG, you can bind a VCG to an SDG. The binding connects the carriers defined in the VCG to the physical port listed in the SDG. After binding, a path from the Virtual Edge Input (VEI) is mapped to the RF channels.

The following example shows how to configure the SDGs and binding:

```
configure terminal cable video
  mgmt-intf VirtualPortGroup 0

service-distribution-group sdg1 id 1
    rpd downstream-cable 7/0/0
virtual-carrier-group vcg1 id 1
    service-type narrowcast
    encrypt
    rf-channel 0-10 tsid 1-11 output-port-number 1-11

bind-vcg
    vcg vcg1 sdg sdg1
```

Configuring the Logical Edge Device and GQI Protocol

The PowerKEY VOD feature on the Cisco cBR-8 is directed by an external Session Resource Manager (SRM) that creates video sessions in response to a subscriber selecting VOD content to watch on the set top box. You must configure a Logical Edge Device (LED) supporting the GQI protocol on the Cisco cBR-8 to support the PowerKEY VOD.

The LED is configured with the GQI protocol as the LED communicates with an external SRM using the GQI protocol. The GQI protocol supports the creation and deletion of sessions on the carriers owned by this LED.

Note Use the following command to get the chassis MAC address:

```
Router#show diag all eeprom detail | include MAC
Chassis MAC Address : 54a2.740e.2000
MAC Address block size : 1024
```

Using the Chassis MAC as a basis, increment the least significant number to give a unique identifier (mac-address) for each LED. This number needs to be unique with respect to the GQI server and does not really relate to a true MAC address. Thus, the number is irrelevant, but needs to be unique.

To configure the Logical Edge Device and GQI Protocol, complete the following procedure:

```
cable video
logical-edge-device led1 id 1
    protocol gqi
```

```
mgmt-ip management ip address
mac-address mac address from this chassis range
server ip address of srm
keepalive retry 3 interval 10
reset interval 8
virtual-edge-input-ip ip addr for content input-port-number num
vcg virtual edge qam name (may be multiple vcgs in an LED)
active
```

Verifying the PowerKEY VoD Configuration

The PowerKEY encrypted VOD LED is active and communicates with the external SRM device after configuring the encryption type on the line card, VCGs, binding of SDGs, and LED with GQI protocol are completed.

To verify the Logical Edge Device configuration, use the show cable video logical-edge-device name led name command or the show cable video logical-edge-device id led number command as shown in the example below:

```
show cable video logical-edge-device name pkvodled
Logical Edge Device: pkvodled
Id: 1
Protocol: gqi
Service State: Active
Discovery State: Disable
Management IP: 1.23.2.10
MAC Address: 54a2.740d.dc99
Number of Servers: 1
Server 1: 1.200.3.75
Reset Interval: 8
Keepalive Interval: 10
Retry Count:3
Number of Virtual Carrier Groups: 1
Number of Share Virtual Edge Input: 1
Number of Physical Qams: 20
Number of Sessions: 0
No Reserve PID Range
Virtual Edge Input:
Input Port  VEI        Slot/Bay  Bundle  Gateway
ID    IP       ID     IP
-------------------------------------------------------------------
1          174.10.2.1   7/0 - -
```

Verify the following:

- The service state of the LED should be active and the other fields must be same as the configured values.
- The connection to the remote SRM should be displayed to ensure that there is a valid network connection to the SRM.
- Execute the show cable video gqi connections command. The following is the sample output when the connection is not established to the SRM:

```
LED Management  Server    Connection     Version Event   Reset       Encryption
ID  IP    IP  Status           Pending Indication  Discovery
-------------------------------------------------------------------------------
1   1.23.2.10  1.200.3.75 Not Connected  0 0        Not Sent     Not Sent
```

The following is the sample output when the connection is established to the SRM:

```
LED Management Server      Connection     Version Event    Reset      Encryption
ID  IP   IP    Status           Pending  Indication Discovery
-------------------------------------------------------------------------------
1   1.23.2.10  1.200.3.75  Not Connected  2 0   ACKED ACKED
```

After the connection is established, the SRM may create encrypted sessions on the carriers of the LED.

- To view the encrypted sessions, use the show cable video session logical-edge-device id led name summary command as shown in the example below:

```
show cable video session logical-edge-device id 1summary
Video Session Summary:

Active        : 1   Init    : 0   Idle      : 0
Off     : 0   Blocked : 0   PSI-Ready : 1
UDP     : 1   ASM     : 0   SSM : 0
Remap   : 1   Data    : 0   Passthru  : 0
Total Sessions: 1
```

- The individual session information can be displayed for the entire LED, for a particular port or line card. The details of a single session may be displayed by specifying a session-id or session-name. To display all the sessions on the LED, use the show cable video session logical-edge-device name led name command as shown in the example below:

```
show cable video session logical-edge-device name pkvodled
Total Sessions = 1

Session Output Streaming Session Destination UDP   Output  Input     Output Input
Id Port  Type      Type               Port  Program State     State  Bitrate
-------------------------------------------------------------------------------
1048576 1      Remap     UDP     174.101.1.1 4915  1 ACTIVE-PSI ON    732788

Output  Encrypt  Encrypt   Session
Bitrate Type     Status    Name
---------------------------------
1715446 PowerKey Encrypted 0x0000000000001
```

If the session is encrypted and transmitted properly, the session is displayed as shown in the above example. The input state is "ACTIVE-PSI". The output state is "ON". For PowerKEY encrypted sessions, the Encrypt Type will be "PowerKey" and the Encrypt Status will be "Encrypted".

If the session is created as a clear session, then the Encrypt Type will be "CLEAR" and the Encrypt Status will be "-".

Configuration Examples

This section provides configuration examples for the PowerKEY VOD feature:

Example: Configuring Encryption Type on the Line Card

The following example shows how to create a management IP interface:

```
configure terminal cable video encryption
linecard 6/0 ca-system powerkey scrambler des
exit
```

Example: Configuring Encrypted Virtual Carrier Groups

The following example shows how to configure the QAM channels from 64 to 158. These channels are encryption capable once the VCG is successfully bound to a Service Distribution Group. The sessions created on these QAM carriers are encrypted using the scrambler installed on the line card.

```
configure terminal cable video
virtual-carrier-group RPC_VCG
encrypt
rf-channel 20-47 tsid 20-47 output-port-number 20-47
virtual-edge-input-ip 174.102.1.1 input-port-number 1
exit
```

Example: Configuring Service Distribution Groups and Binding

The following example shows how to configure the service distribution groups and binding:

```
configure terminal cable video
  mgmt-intf VirtualPortGroup 0

service-distribution-group sdg1 id 1
    rpd downstream-cable 7/0/0
virtual-carrier-group vcg1 id 1
    service-type narrowcast
    encrypt
    rf-channel 0-10 tsid 1-11 output-port-number 1-11

bind-vcg
    vcg vcg1 sdg sdg1
logical-edge-device led1 id 1
    protocol gqi
      mgmt-ip 1.22.2.10
      mac-address c414.3c17.e001
      server 1.200.1.189
      keepalive retry 3 interval 10
      reset interval 8
      virtual-edge-input-ip 174.102.1.1 input-port-number 1
      vcg vcg2
      active
```

Feature Information for Rmote PHY PowerKEY VoD

Note The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 2: Feature Information for RPHY PowerKEY VoD

Feature Name	Releases	Feature Information
Remote PHY PowerKEY VoD	Cisco 2x2 RPD Software 2.x	This feature was introduced on the Cisco 2x2 Remote PHY Device.