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 Cisco cBR-8 specifically for each request.

Contents

- Information About PowerKEY VOD, page 1
- How to Configure PowerKEY VOD, page 2
- Configuration Examples, page 7
- Feature Information for PowerKEY VOD, page 8

Information About PowerKEY VOD

PowerKEY Video On Demand is used in a Cisco cable environment to provide edge-encrypted video-on-demand movies and other content to subscribers. The subscriber selects the content via 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 destined for the RF carrier, and transmits the RF signal from the RF port.

PowerKEY VOD allows the operator to provide secure, encrypted video streams to a particular subscriber over the RF plant.

Overview of PowerKEY VOD

PowerKEY VOD allows the operator to provide secure, encrypted video streams to a particular subscriber over the RF plant.

How to Configure PowerKEY VOD

- Configuring the Encryption Type on the Line Card
- Configuring the Encrypted Virtual Carrier Groups
- Configuring the Service Distribution Groups and Binding
- Configuring the Logical Edge Device and GQI Protocol
- Verifying the PowerKEY VOD Configuration

Configuring the Encryption Type on the Line Card

The Cisco IOS-XE Release 16.5.1 supports PowerKey and PME 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** [**pme** | **powerkey**] **scrambler** *scrambler-type*
exit
PowerKey currently supports DES and Privacy Mode Encryption (PME) supports DVS-042 type of encryption, as given in the following table:

Table 1: Supported Encryption Types and Scrambler Modes

Encryption Type	Scrambler Mode
PME	DVS-042
PKEY	DES, 3DES

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 example below:

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*
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 ports.

To configure the SDGs and binding, complete the following procedure:

configure terminal
cable video
service-distribution-group *sdg name* **id** *sdg number*
onid *onid for port*
rf-port integrated-cable *slot/bay/port*
exit
bind-vcg
vcg *vcg-name* **sdg** *sdg-name*
end

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.

Tip 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:

configure terminal
cable video
logical-edge-device *led name* **id** *led number*
protocol gqi
mgmt-ip *management ip address*
mac-address *mac address from this chassis range*
server *ip address of srm*
virtual-edge-input-ip *ip addr for content* **[vrf]** *vrf name* **input-port-number** *num*
vcg *virtual edge qam name (may be multiple vcgs in an LED)*
active *n*
end

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) **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
```

Once 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 *1***summary**

```
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 "-".

If the GQI connection is not in connected state or if the sessions are not in the proper states then, troubleshoot the connection. For more information, see Troubleshooting Tips, on page 6.

Troubleshooting Tips

GQI Connection

GQI connection problems can be the result of a problem in the network, such as a problem in the external SRM device, or in the Cisco cBR-8 configuration. The first problem is beyond the scope of this document, however to verify the Cisco cBR-8 configuration, the management interface port must be configured properly and be active (not shutdown).

Session Input State

- If a session's input state is "OFF" or another state that is not "ACTIVE_PSI" then the problem is related to content receiving on the Cisco cBR-8. This could be a problem elsewhere in the head-end network or with the video streaming device. The Virtual Edge Input address specified in the LED should match the destination IP address used by the streaming device.

  To display the LED, use the following command:

  show cable video logical-edge-device id *led number*

- The Virtual Edge Inputs are listed in the output. Check the streaming device to ensure the destination IP address matches the appropriate VEI. Additionally, verify whether the UDP port of the video content from the streamer matches the UDP port shown in the session display on the Cisco cBR-8, using the following command:

  show cable video session logical-edge-device id *led number*

- The TenGigabitEthernet port where the VEI address is routed must not be in the shutdown state. To check the appropriate interface, use the following command:

  show interface TenGigabitEthernet *slot/bay/port*

Session Output State

- If a session's input state is "Active-PSI" and the output state is not "OFF", then the problem is related to the physical port channel configuration. The output of the **show logical edge device** command also shows all the carriers and their Admin and Operation state.

  To display the carriers and their state, use the following command:

  show cable video scg logical-edge-device id *number*

```
show cable video logical-edge-device id number
Integrated Physical Admin Operational TSID ONID Output VCG   SDG  Encryption
Cable      QAM ID   State State                 Port   ID    ID   Capable
-------------------------------------------------------------------------------
8/0/0:0    0        ON    UP           1   100   1      1     1    powerkey
8/0/0:1    1        ON    UP           2   100   2      1     1    powerkey
8/0/0:2    2        ON    UP           3   100   3      1     1    powerkey
8/0/0:3    3        ON    UP           4   100   4      1     1    powerkey
```

- If the output port corresponding to the session does not show "ON" for Admin State and an Operational State as "UP", then there is a problem with the configuration.To display the output port details, use the following command:

  show cable video output-port *output port number*

Session Encrypt Status

- If an encrypted GQI session has an Output State or Encrypt Status of "Pending", it means there is a problem with the PowerKEY encryption of the session, or it is possible the encryption on the session is just getting ready to start. First the session command should be executed over a few seconds to ensure that the session was not transitioning from Pending to Active. If the state is Pending, then there is a problem with the encryption.

  To troubleshoot this problem the operator can check the Scrambling Control Group (SCG) that corresponds to this session. Using the session id from the session display, the SCG ID can be found using the following command:

  show cable video scg logical-edge-device id*led number*

```
LED 1 has 8137 SCGs on 128 carriers

SCG ID     Session ID  LED   TSID  ONID
-----------------------------------------
68157683   1048819     1     1     100
68157684   1048820     1     1     100
```

  To verify the SCG ID of the session, use the following command:

  show cable video scg logical-edge-device id *led number* | **inc** *session id*

```
68157684   1048820     1     1     100
```

  To verfiy the SCG session information, use the following command:

  show cable video scg id *SCG id*

```
SCGid: 68157684
Status: SUCCESS
TSID:    1
ONID:  100
Nominal CP: 550
```

  If the Status does not show SUCCESS, then there must be a problem with the Encrypted Key exchange between the Cisco cBR-8 and SRM.

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 *7/0* **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 *vod-group*
rf-channel *64-158* **tsid** *64-158* **output-port-number** *64-158*
virtual-edge-input-ip*14.1.1.1* **input-port-number** *1*
virtual-edge-input-ip*14.2.1.1* **vrf** *Video-VOD-Vrf***input-port-number** *2*
encrypt
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
logical-edge-device *pkvodled* **id** *1*
protocol gqi
mgmt-ip *1.20.2.10*
mac-address *54ab.6409.dc99*
server *1.200.3.75*
virtual-edge-input-ip *174.10.2.1* **input-port-number** *1*
virtual-edge-input-ip *174.11.2.1* **vrf** *Video-VOD-Vrf***input-port-number** *2*
vcg *vod-grp*
active *n*
end

Feature Information for PowerKEY VOD

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

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

Table 2: Feature Information for PowerKEY VOD

Feature Name	Releases	Feature Information
PowerKEY VOD	Cisco IOS XE Everest 16.6.1	This feature was integrated on the Cisco cBR Series Converged Broadband Routers.