Table-Based Video and VPME Encryption

Table-based video is a configuration mode for video sessions. This feature statically maps UDP flows into appropriate RF QAM channels. Each UDP flow is identified by the destination IP address of the MPEG traffic and UDP port number. The configuration contains the input port number, which is resolved into a unique destination IP address, the UDP port, and an output program number.

The Video on Demand (VOD) Privacy Mode Encryption (PME) enables the Cisco Edge QAM Manager (CEM) to encrypt the VOD content streamed through Motorola/Arris VOD systems. PME encryption is applicable for table-based sessions.

- Overview of VPME, on page 1
- How to Configure Table-Based Video Session, on page 2
- How to Configure VPME Encryption, on page 12
- Configuration Examples For VPME Encryption, on page 15
- Feature Information for Table-Based Video and VPME Encryption, on page 16

Overview of VPME

The PME Video On Demand system integrates the encrypted VOD content within an Arris digital cable headend. A VOD system provides the clear content while the Cisco cBR-8 and CEM are added to provide encryption. The details on the usage of the CEM are described in this chapter. Every MSO site should have the CEM application, which is the single entity connecting to the Arris Encryption Renewal System (ERS). All the Cisco cBR-8s on this MSO site should connect to this CEM.

Prerequisites for VPME

To enable VPME encryption, the connection to the CEM should be configured. VPME is a licensed feature and requires appropriate license on the chassis. The following connection should be configured:

- The video traffic flow on the Ten Gigabit interface.
- Table-based video sessions.
- QAM PHY parameters for the physical QAM channel.
Restrictions for VPME

You can configure the line card in only one mode as the table-based session configuration and dynamic GQI-based sessions are mutually exclusive. Hence, PME and PowerKey encryption are also mutually exclusive modes at the line card level. For more details, see Configuring the Encryption Type on the Line Card section.

How to Configure Table-Based Video Session

Configuring Table-Based Video

Before You Begin

Before configuring table-based sessions, you must configure the physical and virtual constructs for Cisco cBR-8. You must also configure the Logical Edge Device (LED), Service Distribution Group (SDG), binding and Virtual Carrier Group (VCG).

The following is an example for LED configuration. In this example, assumes that the video traffic is routed via the input ports of Virtual Edge Input (VEI).

```
logical-edge-device pme_tbv id 1
    protocol table-based
    virtual-edge-input-ip 172.16.0.1 input-port-number 1
    vcg pme_tbv
    active
```

In the above example, protocol table-based indicates that this LED supports table-based sessions.

For more information, see the How to Configure the Logical Edge Devices section. For details related to D6 protocol, see the How to Configure the D6 Discovery Protocol section.

Configuring Table-Based Session : VEI Input Port-Based

To configure the table-based session based on Virtual Edge Input (VEI), complete the following procedure:

```
configure terminal
cable video
table-based
vcg vcg-name
rf-channel n-m
session name {input-port number | bundle-id number}
    start-udp-port number num-sessions-per-qam number processing-type
    (program | data ) start-program number [repeat] jitter
    ms {cbr | vbr }
exit
```

The table-based keyword is the root keyword. The entire table-based configuration should be under this keyword. Within this, the configuration is separated based on the VCG. Within each VCG, the configuration can be created for each QAM channel.

- Processing-type
  - Remap—Configures VoD sessions as remap.
  - Data—Configure video streams that are not dejittered, and remapped. For example, Beacons, carousel, and so on.
• Repeat—Repeats the program number across QAM channels.

Example:

The following is an example in which two sessions are created on all QAM channels from 20 to 22.

```bash
configure terminal
cable video
table-based
vcg pme_tbv
rf-channel 20-22
session bago_tbv input-port 1 start-udp-port 49152 num-sessions-per-qam 2 processing-type remap start-program 32 jitter 150 cbr
exit
```

The following is an example in which one session is created on each QAM channel.

```bash
configure terminal
cable video
table-based
vcg pme_tbv2
rf-channel 23
session pme_tbv input-port 1 start-udp-port 50152 num-sessions-per-qam 1 processing-type remap start-program 5 jitter 150 cbr
```

```bash
rf-channel 24
session pme_tbv input-port 1 start-udp-port 50153 num-sessions-per-qam 1 processing-type remap start-program 5 jitter 150 cbr
exit
```

### Configuring Table-Based Session: VEI Bundle-Based

**Before You Begin**

- Create two or more VEIs.
- Bundle the VEIs.

For more details, see *Virtual Edge Input Bundling* section.

To configure the VEI bundled table-based session, complete the following procedure:

```bash
configure terminal
cable video
table-based
vcg vcg-name
rf-channel n-m
session name bundle-id number start-udp-port
number num-sessions-per-qam number processing-type
{program | passthru | data } start-program number
{[repeat] jitter ms | cbr | vbr }
exit
```

Example:

The following is an example in which a session is created for VEI bundle (10).

```bash
configure terminal
cable video
table-based
vcg pme_vcg
rf-channel 20-21
session tbv bundle-id 10 start-udp-port 49152 num-sessions-per-qam 2 processing-type remap
```
Virtual Edge Input Bundling

To create and bundle the VEIs, complete the following procedure:

```sql
configure terminal
cable video
logical-edge-device name
protocol table-based
virtual-edge-input-ip ip address input-port-number number
vcg vcg-name
vei-bundle id input-port-number number
active
exit
```

Example:

The following is an example in which a bundle (10) is created with two input ports (1 and 2) each with distinct IP address.

```sql
configure terminal
cable video
logical-edge-device pme_led id 1
protocol table-based
virtual-edge-input-ip 172.16.0.1 input-port-number 1
virtual-edge-input-ip 172.16.0.1 input-port-number 2
vcg pme_vcg
vei-bundle 10 input-port-number 1,2
active
exit
```

Verifying Table-Based Video Configuration

Verify All Sessions Configured on an LED

To verify all the sessions configured on a particular LED, use the `show cable video session logical-edge-device id number` command as shown in the example below:

```sql
show cable video session logical-edge-device id 1
Total Sessions = 6
```

<table>
<thead>
<tr>
<th>Session</th>
<th>Output</th>
<th>Streaming</th>
<th>Destination</th>
<th>UDP</th>
<th>Input</th>
<th>Output</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encrypt</td>
<td>Encrypt</td>
<td>Encrypt</td>
<td>Session</td>
<td>Type</td>
<td>Port</td>
<td>Type</td>
<td>Port</td>
<td>Program</td>
</tr>
<tr>
<td>Id</td>
<td>Status</td>
<td>Name</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048576</td>
<td>1</td>
<td>Remap</td>
<td>UDP</td>
<td>174.21.1.1</td>
<td>49152</td>
<td>32</td>
<td>ACTIVE-PSI ON</td>
<td>1718234</td>
</tr>
<tr>
<td>CLEAR</td>
<td></td>
<td>bago_tbv.1.0.1.20.49152</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048577</td>
<td>1</td>
<td>Remap</td>
<td>UDP</td>
<td>174.21.1.1</td>
<td>49153</td>
<td>33</td>
<td>ACTIVE-PSI ON</td>
<td>1718631</td>
</tr>
<tr>
<td>CLEAR</td>
<td></td>
<td>bago_tbv.1.0.1.20.49153</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048578</td>
<td>2</td>
<td>Remap</td>
<td>UDP</td>
<td>174.21.1.1</td>
<td>49154</td>
<td>34</td>
<td>ACTIVE-PSI ON</td>
<td>1717832</td>
</tr>
<tr>
<td>CLEAR</td>
<td></td>
<td>bago_tbv.1.0.1.21.49154</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048579</td>
<td>2</td>
<td>Remap</td>
<td>UDP</td>
<td>174.21.1.1</td>
<td>49155</td>
<td>35</td>
<td>ACTIVE-PSI ON</td>
<td>1717322</td>
</tr>
<tr>
<td>CLEAR</td>
<td></td>
<td>bago_tbv.1.0.1.21.49155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048580</td>
<td>3</td>
<td>Remap</td>
<td>UDP</td>
<td>174.21.1.1</td>
<td>49156</td>
<td>36</td>
<td>ACTIVE-PSI ON</td>
<td>1718697</td>
</tr>
<tr>
<td>CLEAR</td>
<td></td>
<td>bago_tbv.1.0.1.22.49156</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048581</td>
<td>3</td>
<td>Remap</td>
<td>UDP</td>
<td>174.21.1.1</td>
<td>49157</td>
<td>37</td>
<td>ACTIVE-PSI ON</td>
<td>1717542</td>
</tr>
</tbody>
</table>
```
verify the summary of the session details

To verify the summary of the session details at a LED level, use the `show cable video session logical-edge-device id number summary` command as shown in the example below:

```
show cable video session logical-edge-device id 1 summary
```

```
Video Session Summary:
Active : 6        Init : 0        Idle : 0
Off : 0        Blocked : 0          PSI-Ready : 6
UDP : 6        ASM : 0            SSM : 0
Remap : 6      Data : 0          Passthru : 0
Total Sessions: 6
```

Verify QAM PHY Parameters of RF-channel

To verify the QAM PHY parameters of RF-channel that are configured on the RF port, which is controller Integrated-Cable 7/0/0, use the `show controllers integrated-Cable slot/bay/port rf-channel n-m` command as shown in the example below:

```
show controllers integrated-Cable 7/0/0 rf-channel 0-95
```

```
Chan State Admin Frequency Type Annex Mod srate Interleaver dcid power output
0  UP  UP  93000000 VIDEO B 256  5361 I32-J4 -  34 NORMAL
1  UP  UP  10500000 VIDEO B 256  5361 I32-J4 -  34 NORMAL
2  UP  UP  11500000 VIDEO B 256  5361 I32-J4 -  34 NORMAL
3  UP  UP  12500000 VIDEO B 256  5361 I32-J4 -  34 NORMAL
4  UP  UP  13500000 VIDEO B 256  5361 I32-J4 -  34 NORMAL
5  UP  UP  14500000 VIDEO B 256  5361 I32-J4 -  34 NORMAL
6  UP  UP  15500000 VIDEO B 256  5361 I32-J4 -  34 NORMAL

Troubleshooting Video and VPME Encryption

Output State is OFF

Procedure

**Step 1** Verify the video traffic using the `show cable video session logical-edge-device id 1` command. In the below example, the output state is OFF. This value confirm that there is no output traffic.

```
1048582 1 Remap  UDP  172.16.0.1 49152 32 OFF OFF 0 0 PME Pending bago_tbv.1.0.1.20.49152
1048583 1 Remap  UDP  172.16.0.1 49153 33 OFF OFF 0 0 PME Pending bago_tbv.1.0.1.20.49153
```
Step 2
Verify if the RF output of the controller is shut using the `show cable video integrated-cable` command.

```plaintext
Router# show cable video integrated-cable 8/0/0
```

<table>
<thead>
<tr>
<th>Integrated TSID</th>
<th>ONID</th>
<th>Output</th>
<th>Physical</th>
<th>Admin</th>
<th>Operational</th>
<th>Virtual-Carrier</th>
<th>Service-Distribution</th>
<th>Logical-Edge Encryption</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/0/0:20</td>
<td>1</td>
<td>0</td>
<td>unavailable</td>
<td>OFF</td>
<td>DOWN</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/0/0:21</td>
<td>2</td>
<td>0</td>
<td>unavailable</td>
<td>OFF</td>
<td>DOWN</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/0/0:22</td>
<td>3</td>
<td>0</td>
<td>unavailable</td>
<td>OFF</td>
<td>DOWN</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/0/0:23</td>
<td>4</td>
<td>0</td>
<td>unavailable</td>
<td>OFF</td>
<td>DOWN</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/0/0:24</td>
<td>5</td>
<td>0</td>
<td>unavailable</td>
<td>OFF</td>
<td>DOWN</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) If the RF output of the controller is shut, you must unshut the port. This action changes the status as ON for the corresponding QAMs. You can verify the state using the `show cable video integrated-cable` command.

```plaintext
Router# show cable video integrated-cable 8/0/0
```

<table>
<thead>
<tr>
<th>Integrated TSID</th>
<th>ONID</th>
<th>Output</th>
<th>Physical</th>
<th>Admin</th>
<th>Operational</th>
<th>Virtual-Carrier</th>
<th>Service-Distribution</th>
<th>Logical-Edge Encryption</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/0/0:20</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>48</td>
<td>ON</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/0/0:21</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>49</td>
<td>ON</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/0/0:22</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>50</td>
<td>ON</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/0/0:23</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>51</td>
<td>ON</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/0/0:24</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>24</td>
<td>ON</td>
<td>pme_tbv</td>
<td>pme_tbv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pme_tbv</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 3
Verify the JIB channel number for a specific QAM channel using the `show cable video integrated-cable` command.

```plaintext
Router# show controllers integrated-Cable 7/0/0 rf-channel 21 verbose
```

<table>
<thead>
<tr>
<th>Chan State</th>
<th>Admin Frequency</th>
<th>Type</th>
<th>Annex Mod</th>
<th>srate</th>
<th>Interleaver</th>
<th>dcid</th>
<th>power</th>
<th>output</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>UP</td>
<td>219000000</td>
<td>VIDEO B</td>
<td>256</td>
<td>I32-J4</td>
<td>-34</td>
<td>NORMAL</td>
<td></td>
</tr>
</tbody>
</table>

Qam profile: 1
Spectrum Inversion: Off
Frequency Lane: 1 Block: 3 index: 6
Resource status: OK
License: granted <01:07:01 EDT Feb 19 2016>
Output Status is Idle or Pending

**Procedure**

**Step 1**
Verify the video traffic. In the below example, the input bitrate is zero, and the input state is IDLE / OFF. These values confirm that there is no input traffic.

```
Router#sh cable video session logical-edge-device id 1
Total Sessions = 6

<table>
<thead>
<tr>
<th>Session</th>
<th>Output</th>
<th>Streaming</th>
<th>Session</th>
<th>Destination</th>
<th>UDP</th>
<th>Output</th>
<th>Input</th>
<th>Output</th>
<th>Input</th>
<th>Output</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encrypt</td>
<td>Encrypt</td>
<td>Encrypt</td>
<td>Encrypt</td>
<td>Encrypt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Id</td>
<td>Type</td>
<td>Status</td>
<td>Port</td>
<td>Name</td>
<td>Type</td>
<td>Port</td>
<td>Program</td>
<td>State</td>
<td>State</td>
<td>Bitrate</td>
<td>Bitrate</td>
</tr>
<tr>
<td>-----</td>
<td>-----</td>
<td>-------</td>
<td>------</td>
<td>------</td>
<td>-----</td>
<td>------</td>
<td>---------</td>
<td>-------</td>
<td>-------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>1048588</td>
<td>1 Remap</td>
<td>UDP</td>
<td>172.16.0.1</td>
<td>IDLE</td>
<td>49152</td>
<td>32</td>
<td>PENDING</td>
<td>0</td>
<td>0</td>
<td>PME</td>
<td></td>
</tr>
<tr>
<td>1048589</td>
<td>1 Remap</td>
<td>UDP</td>
<td>172.16.0.1</td>
<td>IDLE</td>
<td>49153</td>
<td>33</td>
<td>PENDING</td>
<td>0</td>
<td>0</td>
<td>PME</td>
<td></td>
</tr>
<tr>
<td>1048590</td>
<td>2 Remap</td>
<td>UDP</td>
<td>172.16.0.1</td>
<td>IDLE</td>
<td>49154</td>
<td>34</td>
<td>PENDING</td>
<td>0</td>
<td>0</td>
<td>PME</td>
<td></td>
</tr>
<tr>
<td>1048591</td>
<td>2 Remap</td>
<td>UDP</td>
<td>172.16.0.1</td>
<td>IDLE</td>
<td>49155</td>
<td>35</td>
<td>PENDING</td>
<td>0</td>
<td>0</td>
<td>PME</td>
<td></td>
</tr>
<tr>
<td>1048592</td>
<td>3 Remap</td>
<td>UDP</td>
<td>172.16.0.1</td>
<td>IDLE</td>
<td>49156</td>
<td>36</td>
<td>PENDING</td>
<td>0</td>
<td>0</td>
<td>PME</td>
<td></td>
</tr>
<tr>
<td>1048593</td>
<td>3 Remap</td>
<td>UDP</td>
<td>172.16.0.1</td>
<td>IDLE</td>
<td>49157</td>
<td>37</td>
<td>PENDING</td>
<td>0</td>
<td>0</td>
<td>PME</td>
<td></td>
</tr>
</tbody>
</table>
```

**Step 2**
Verify details of the video traffic over the mid plane interface through which traffic is routed to the video data plane on the line card. The mid plane is specific to the line-card slot. On subsequent trials, the output packet count should keep increasing. You can verify the output packet count using the `show interfaces video` command.
### Step 3

If the packet count is not increasing, verify the 10 GigE physical interface through which the video traffic is fed to the chassis using the `show interfaces` command. In the below example, the video traffic is fed through the 10GigE interface 4/1/0 and the counter for packets keeps incrementing.

```plaintext
Router#show interfaces tenGigabitEthernet 4/1/0 accounting
TenGigabitEthernet4/1/0
Protocol  Pkts In  Chars In  Pkts Out  Chars Out
  Other    15    1155    1816    109198
  IP  8047199112 9415222959870 0 0
  DEC MOP    15    1155    14    1078
  ARP       0       0       1      60
```

---

### Input State is Active and not Active PSI

If the input state is Active and the input PSI information is not detected, verify the input PMT information section for this particular session.

**Procedure**

Verify the details of a particular video session, using the `show cable video session logical-edge-device id led-id session-id id` command.

```plaintext
Router#show cable video session logical-edge-device id 1 session-id 1048599
Session Name : bago_tbv.1.0.1.22.49157
Session Id: : 1048599
Output Port : 3
TSID : 3
ONID : 0
Number of Sources : 1
Destination IP : 172.16.0.1
UDP Port : 49157
Config Bitrate : 2000000
```
Abnormalities on the Output

If there are any abnormalities in the output such as macro blocks, ans so on, verify if there are any issues such as CC errors or PCR errors in the MPEG packet.

Verify the session details, using the `show cable video session logical-edge-device id led-id session-id id` command. This command displays errors for both input session stats and output session stats.
Configuring CEM Connectivity for PME Encryption

This section explains how to configure the connectivity to the external CEM and enforce PME encryption on the line card.

Only one device from the MSO site can communicate with the Encryption Renewal System (ERS) and obtain the latest ECM templates. The CEM communicates with the ERS and sends the ECM templates to the Cisco Edge QAM devices in the MSO site.

You can configure the following:

- **VODS-ID**—IDs assigned by CCAD/ARRIS to the MSO site. The configured VODS-ID on the Cisco cBR-8 and the CEM must be same.
- **CEM IP**—Interface IP of the Windows/Linux system through which the CEM can be reached by Cisco cBR-8.
- **CEM Port**—Port number on which the CEM listens for connections from the Cisco cBR-8.
- **Management Interface**—Source IP address of the cBR-8 virtual interface through which the connection must be established with the CEM server.

**Note**

There can be only one entry for VODS-ID, CEM IP, CEM Port, and Management Interface IP. If you configure any new values for these parameters, the previous configuration is cleared. You can clear the configurations using the 'no' form of the command.

**Configuring VODS-ID**

To configure the VODS-ID of the CEM, perform the following steps:

```
enable
configure terminal
cable video
encryption
pme vodsid id
exit
```

**Configuring CEM IP and Port**

To configure the CEM IP and port of the CEM, perform the following steps:

```
enable
configure terminal
cable video
encryption
pme cem ip-address tcp_port
exit
```

**Configuring Management IP**

To configure the PME management IP address to establish CEM connection, perform the following steps:
The virtual port group must be configured before configuring the management IP. For more information, see the Configuring the VirtualPortGroup Interface section.

```
enable
cfg t
vport
ptgp
ip mgmt-ip ip-address
exit
```

**Verifying CEM Connectivity**

To verify the connection status of PME, use the `show cable video encryption pme status` command as shown in the following example:

```
Router#show cable video encryption pme status
PME Connection Status:
VODS-ID : 111
CEM IP : 1.200.1.163
CEM Port : 5000
Local Mgmt IP : 1.24.2.6
Local Port : 50394
CEM Connection State : Connected
Count of ECMs recd : 2
```

**Troubleshooting Tips**

**Connectivity with CEM is Lost**

**Procedure**

**Step 1**  If the CEM connection status is Not Connected, verify the VODS-ID, CEM IP, CEM port and local Mgmt IP address parameters using the `show cable video encryption pme status` command.

```
Router#show cable video encryption pme status
PME Connection Status:
VODS-ID : 111
CEM IP : 1.200.1.163
CEM Port : 5000
Local Mgmt IP : 1.35.2.5
Local Port : 0
CEM Connection State : Not Connected
```

**Step 2**  If the PME connection parameters are valid, ensure there is route from the Cisco cBR-8's Virtual management interface to the CEM by using the ping command. Ping the CEM IP address from the virtualPortGroup 0 on which the management IP is created.

```
Router#ping 1.200.1.163 source virtualPortGroup 0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.200.1.163, timeout is 2 seconds:
Packet sent with a source address of 1.35.2.1
```
How to Configure VPME Encryption

Enforcing Data Stream Encryption Type

Before You Begin

Configure the Virtual Carrier Group (VCG) to setup an encrypted session. For more details, see Configuring Virtual Carrier Group section.

To configure the encryption type for a VOD session, perform the following steps:

```
enable
configure terminal
cable video
cable video encryption
linecard slot/bay ca-system [dvb | pme | powerkey] scrambler scrambler-type
[dvb-csa | des | dvs042]
exit
```

Configuring Virtual Carrier Group

To configure the Virtual Carrier Group (VCG) for setting up an encrypted session, perform the following steps:

```
enable
configure terminal
cable video
cable video encryption
virtual-carrier-group name [id number]
rf-channel start-channel number-end-channel number tsid start-tsid-end-tsid
output-port-number start-num-end-num
virtual-edge-input ip addr input-port-number port-number
encrypt
exit
```

Verifying VPME Encryption Configuration

- To verify the encryption configurations, use the `show cable video encryption linecard [all | slot number]` command as shown in the following example:
Router#show cable video encryption linecard 7/0
Line card: 7/0
CA System Scrambler
====================================
PME dvs-042

- To verify the encryption status of all sessions on an LED, use the `show cable video session logical-edge-device id id` command as shown in the following example:

Router#show cable video session logical-edge-device id 1
Total Sessions = 6

<table>
<thead>
<tr>
<th>Output</th>
<th>Streaming</th>
<th>Session Destination UDP</th>
<th>Input</th>
<th>Output</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encr</td>
<td>Encrypt</td>
<td>Session Port Type Type</td>
<td>Program State State Bitrate Type Status Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Id</td>
<td>Port</td>
<td></td>
<td>Port</td>
<td>Port</td>
<td>Port</td>
</tr>
<tr>
<td>Bitrate</td>
<td>Type</td>
<td></td>
<td></td>
<td>Bitrate</td>
<td></td>
</tr>
<tr>
<td>1048582</td>
<td>Remap</td>
<td>UDP 172.16.0.1 49152</td>
<td>32</td>
<td>ACTIVE-PSI ON 996413</td>
<td></td>
</tr>
<tr>
<td>981109</td>
<td>PME</td>
<td>Encrypted bago_tbv.1.0.1.20.49152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048583</td>
<td>Remap</td>
<td>UDP 172.16.0.1 49153</td>
<td>33</td>
<td>ACTIVE-PSI ON 1004787</td>
<td></td>
</tr>
<tr>
<td>981246</td>
<td>PME</td>
<td>Encrypted bago_tbv.1.0.1.20.49153</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048584</td>
<td>Remap</td>
<td>UDP 172.16.0.1 49154</td>
<td>34</td>
<td>ACTIVE-PSI ON 995088</td>
<td></td>
</tr>
<tr>
<td>984011</td>
<td>PME</td>
<td>Encrypted bago_tbv.1.0.1.21.49154</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048585</td>
<td>Remap</td>
<td>UDP 172.16.0.1 49155</td>
<td>35</td>
<td>ACTIVE-PSI ON 993061</td>
<td></td>
</tr>
<tr>
<td>984051</td>
<td>PME</td>
<td>Encrypted bago_tbv.1.0.1.21.49155</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048586</td>
<td>Remap</td>
<td>UDP 172.16.0.1 49156</td>
<td>36</td>
<td>ACTIVE-PSI ON 994238</td>
<td></td>
</tr>
<tr>
<td>988617</td>
<td>PME</td>
<td>Encrypted bago_tbv.1.0.1.22.49156</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048587</td>
<td>Remap</td>
<td>UDP 172.16.0.1 49157</td>
<td>37</td>
<td>ACTIVE-PSI ON 1004658</td>
<td></td>
</tr>
<tr>
<td>988602</td>
<td>PME</td>
<td>Encrypted bago_tbv.1.0.1.22.49157</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- To verify the various sessions, which use the PME modules that are loaded on a specific line-card, use the `show cable video encryption pme linecard slot/bay session 1-65535 | all | summary` command as shown in the example below:

Router#show cable video encryption pme linecard 7/0 session all
Count of ECMG Streams: 4
---------------------------------------- ECMG Stream DATA ----------------------------------------
Stream ID num EcmId CP# CwE CFDur NomCPD EcmRqst EcmRsp
---------------------------------------- ---- ---- ---- ---- ---- ---- ----
0020(0032) 0020(0032) 0002 0 0 40000 7 2
0021(0033) 0021(0033) 0002 0 0 40000 7 2
0040(0064) 0040(0064) 0002 0 0 40000 7 2
0041(0065) 0041(0065) 0002 0 0 40000 7 2

Router#show cable video encryption pme linecard 7/0 session 32
Stream 32, session 7681 is active
Stream number = 32 Session number = 7681
ECM requests = 8 ECM replies = 2
ECM ID = 32 CryptoPeriod num = 2
CP duration = 0 Nominal duration = 40000
CA transfer mode = 1 Stream status = No
Error Blob details

Router#show cable video encryption pme linecard 7/0 session summary
Currently active streams:
Active = 4
ECM req/resp mismatch = 4
Troubleshooting Tips

No PMT at the Output

Procedure

**Step 1** Verify the encryption status using the `show cable video session logical-edge-device id` command. If the encrypt status is shown as ca-waiting, then PMT is withheld.

    Router# show cable video session logical-edge-device id 1
    Total Sessions = 6

    | Id | Port | Type | Type | Port | Program | State   | Bitrate | Bitrate |
    |----|------|------|------|------|---------|---------|---------|---------|
    | 1048582 | Remap | UDP | 172.16.0.1 | 49152 | 32 | ACTIVE-PSI | PENDING | 996413 | 981109 |
    |     | PME | ca-waiting | bago_tbv.1.0.1.20.49152 |

**Step 2** Verify if the ECM count is zero using the `show cable video encryption pme status` command.

    Router# show cable video encryption pme status
    PME Connection Status:
    VODS-ID : 111
    CEM IP : 1.200.1.163
    CEM Port : 5000
    Local Mgmt IP : 1.24.2.6
    Local Port : 50394
    CEM Connection State : Connected
    Count of ECMs recd : 0

**Step 3** Verify if the ECM request or response count is 0 using the `show cable video encryption pme linecard slot/bay session summary` command.

    Router# show cable video encryption pme linecard 7/0 session summary
    Currently active streams:
    Active = 4
    ECM req/resp mismatch = 4
    ECM req, all streams = 32
    ECM resp, all streams = 8
    Since last reset:
    Sessions created = 4
    Sessions deleted = 0
    ECMs received = 2
    ECMs discarded = 0
Configuration Examples For VPME Encryption

The following example shows running output for a PME configuration:

cable video

gmtr-intf virtualPortGroup 0

virtual-carrier-group pme_tbv
encrypt
service-type narrowcast
rf-channel 20-24 tsid 1-5 out 1-5

service-distribution-group pme_tbv
rf-port integrated-cable 7/0/0

bind-vcg
vcg pme_tbv sdg pme_tbv

encryption
linecard 7/0 ca-system pme scrambler dvs
pme vodsid 111
pme cem 1.200.1.163 5000
pme mgmt-ip 1.25.2.6

logical-edge-device pme_tbv
protocol table-based
virtual-edge-input-ip 174.101.1.1 input 1
vcg pme_tbv
active

table-based
vcg vcg_replication
rf-channel 21-31

session pme_tbv1 in 1 start-udp-port 49152 num-sessions-per-qam 2 processing-type remap
start-program 32 jitter 150 cbr

session pme_tbv2 in 1 start-udp-port 50001 num-sessions-per-qam 2 processing-type remap
start-program 64 jitter 150 cbr

Use Cases or Deployment Scenarios

Topology

A typical topology for CEM connectivity is shown below:
Feature Information for Table-Based Video and VPME Encryption

Use Cisco Feature Navigator to find information about the 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 the www.cisco.com/go/cfn link. An account on the Cisco.com page is not required.

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 1: Feature Information for Table-Based Video and VPME Encryption

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table-Based Video and VPME Encryption</td>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This feature was integrated on the Cisco cBR Series Converged Broadband Routers.</td>
</tr>
</tbody>
</table>