Expanded GQI Protocol Support

This document provides information on the GQI protocol support provided by the Cisco cBR-8 series routers. It also explains how to manage the Announce Event Messages generated as part of the GQI support.

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.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://tools.cisco.com/ITDIT/CFN/. An account on http://www.cisco.com/ is not required.

Hardware Compatibility Matrix for the Cisco cBR Series Routers

Note   The hardware components that are introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.

Information About GQI Protocol Support

Cisco cBR-8 routers support the Generic QAM Interface (GQI) version 1, version 1 Extension, and version 2.

- GQIv1—This version does not support announce messages. However, the Cisco cBR-8 router generates GQIv1 extension announce event messages. To use GQIv1, you must block the announce messages on Cisco cBR-8.

- GQI v1 Extension—Provides a more neutral distribution path to non-cisco SRM products. This version supports type-2 commands, three announce messages, and offers a filtering mechanism to alleviate

flooding the SRM with events. GQIv1 extension also supports more than 255 QAM carriers on each LED.

- GQI v2—Provides a generic QAM for the Explorer Controller (EC) and USRM.

On Cisco cBR-8, the eQAM is an embedded software process running on the Supervisor card. You can consider the eQAM as a Logical Edge Device (LED) and configure up to a maximum number of 32 LED instances running simultaneously. Each LED manages a set of QAM carriers for video session management. These LEDs interface remotely with SRMs using the GQI protocol.

If the remote SRM registers for both v1 and v2, the LED accepts the latest version. However, when the SRM sends a GQI request as v1, the Cisco cBR-8 router accepts v1, sends a response for v1, and also sends the announce event messages to the SRM in the GQIv1 Extension format.

The following table shows the features supported by GQIv1, GQIv1 Extension, and GQIv2.

Features	GQIv1	GQI v1 Extension	GQI v2
Announce Messages	None	2104, 5406, and 5200	All
Output Port (Number)	<= 255	> 255 Supported	> 255 Supported
Encryption	No	No	Yes

GQI Announce Event Messages

The LED sends Announce events that match the GQI version on the SRM. The GQI v1 Extension protocol uses Announce event messages for GQIv1 Extension and GQI v2 uses Announce event messages for v2.

Some SRMs may not handle the announce events or may only generate a log when it receives the announce event messages from the eQAM, without taking any action. To avoid flooding and minimize the number of Remote Procedure Call (RPC) messages sent to the server, the operator can disable the announce events on the LED through the Cisco cBR-8 CLI.

Cisco cBR does not provide announce event messages for GQIv1. However, with GQI v1 Extension, Cisco cBR provides three announce event messages. The GQIv2 protocol support provides all the supported GQI announce event messages.

Supported Announce Events

GQIv1 Extension supports the following announce events:

- Stream Active (2104)—The stream is successfully established and the session is active.

- Multicast Source Change (5406)—This event is triggered when the LED detects a loss of input of the source stream from the current multicast source and it fails over to a redundant multicast source.

- Stream Lost (5200)—The stream is lost and the video becomes idle or off.

GQIv2 supports the following announce event messages:

Code	Message	Description
2104	Stream Active and PSI built	The stream is successfully established, the PSI is built, and the session is active.
4400	Error Reading Content Data - PID Conflict	In some applications, the SRM can request not to remap the PID (no PID remapping). If this mode is used, the PID conflicts are not revealed to the eQAM until it sees the stream from the data plane. The eQAM sends an Announce request to the SRM when eQAM detects a PID conflict.
4401	Input TS invalid	When PAT and PMT are not found in the input stream.
5200	Stream Lost	The stream is lost and the video becomes idle or off.
5401	Downstream Failure	When QAM fails.
5404	Unable to Join	When LED attempts fails for all multicast transports.
5405	Input Failure	When eQAM fails to update the configuration for existing sessions.
5406	Multicast Source Change	This event is triggered when the LED detects a loss of input of the source stream from the current multicast source and it fails over to a redundant multicast source.
5502	Internal software error	When software error occurs or other codes do not apply.
5602	Bandwidth Exceed	When actual bandwidth exceeds the configured session bandwidth.

Blocking Announce Event Messages

To prevent flooding of too many announce events, you can specify how the announce event messages should be delivered to the SRM. If configured, the announce event is sent one at a time synchronously.

To use blocking mode for announce event messages, specify a timeout value range from 0 to 240 seconds. If the timeout value is greater than zero, after sending the announce event message to the server, LED sets up a timer with the timeout value, and waits for the announce event acknowledgement. If the timer expires before receiving the acknowledgement, the next announce event in the queue is sent and the timer is restarted. The failed announce event is discarded.

To disable blocking the announce event messages, you should set the timeout value to 0 which is the default value. If the value is zero, the LED does not wait for the announce acknowledgement before sending the next message. All announce events are sent to the SRM instantly.

GQI Announce Event Profile

The announce event profile allows the user to define how announce events are managed in the GQI protocol. The profile can include a timeout value for blocking the event messages and the list of events that the operator wants to filter.

The GQI Announce Event Profile provides the following functions and you can assign it to any GQI LED.

- Filtering out all announce events.

  This command disables and does not forward announce events to SRM.

- Timeout value for sending the announce event.

- In blocking mode, this timeout is triggered when the announce event acknowledgement is not received within a specified time.

- Filtering subset of unwanted events.

You can assign the announce event profile to an LED at any time, even when the LED is already active. If the server is already connected and in service, and an event profile is updated, which is already assigned to an LED, all existing announce events in the queue are discarded and restarted according to the new changes.

Prerequisites for Configuring GQI Announce Event Profile

To configuring GQI Announce Event Profile, the announce profile must be applied to the LED that supports the GQI protocol.

Restrictions for Configuring GQI Announce Event Profile

Announce event profile applies only to logical-edge-devices (LED) that support GQI protocol. The profile is not intended for table-based sessions.

How to Configure GQI Announce Events

This section contains the following:

Verifying the Logical Edge Device

To display the Announce Event profile that is assigned to the GQI LED, use the show cable video logical-edge-device command as given in the following example.

```
Router# show cable video logical-edge-device id 2
Logical Edge Device: led2
Id: 2
Protocol: GQI
Service State: Active
Discovery State: Disable
Management IP: 192.0.2.1
MAC Address: <MAC address>
Number of Servers: 2
    Server 1: 203.0.113.1
    Server 2: 203.0.113.1
Reset Interval: 5
Keepalive Interval: 5    Retry Count:3
```

```
Announce Event Profile: profile-2     Id: 3
Number of Virtual Carrier Groups: 1
Number of Share Virtual Edge Input: 1
Number of Physical Qams: 4
Number of Sessions: 0
No Reserve PID Range

Virtual Edge Input:
Input Port VEI     Slot/Bay  Bundle  Gateway
ID         IP                ID      IP
---------------------------------------------
1          x.x.1.1  7/0      -       -

Virtual Carrier Group:
ID   Name   Total     Total   Service-Distribution-Group  Service-Distribution-Group
VEI         RF-channel        Name                         ID
------------------------------------------------------------------------------------
2    vcg2     0        4      sdg2                         2
```

Verifying the GQI Connection

The following example shows the GQI connection details using the show cable video gqi connections command:

```
Router# show cable video gqi connections

LED   Management   Server   Connection   Protocol Event   Reset       Encryption
ID    IP           IP       Status       Version  Pending Indication  Discovery
-----------------------------------------------------------------------------
2     x.x.x.x      x.x.x.x  Connected    2        2       ACKED       Sent
```

Configuration Example for Announce Event

This section provides example for the GQI Announce Event Profile configuration.

Disabling Announce Event Profile

By default, all announce events are enabled. If all the events are filtered, the ack-timeout configured in the profile is no longer applicable, until you remove the filtering of all-events from the profile.

When you set the filtering to filter all-events, the individual event codes are removed from the CLI. The user is prompted before the changes take effect.

Use the following commands to disable announce events:

```
enable
configure terminal
cable video
  announce-event-profile disable-all id 1
     filter all-events

logical-edge-device led-1 id 1
   protocol gqi
    event-profile disable-all
    vcg vcg-1
    active
```

Filtering Announce Events

You can filter the events, and add or remove a filter, when the LED is in active mode. When the filtering is enabled, the events that are generated and still queued, are discarded, and are not sent to the SRM.

The following example shows how to filter a subset of events to the SRM, and uses synchronous send:

```
cable video
  announce-event-profile gqi-led-1 id 2
      ack-timeout 240
      filter 5502
      filter 5602

logical-edge-device led-1 id 1
   protocol gqi
    event-profile gqi-led-1
    vcg vcg-1
    active
```

Use the no command to revert it to the default value. If the ack-timeout is set to 0 or no ack-timeout, the LED resumes the non-blocking event and sends messages to the SRM. All pending events in the Cisco cBR router queue are forwarded to the SRM without waiting for the announce event acknowledgement. If you remove the filter command, the GQI resumes generating that specific event code and reports it to the SRM.

Verifying the Announce Event Profile Configuration

To display the configuration of announce event profile and a list of LEDs that use the profile, use the **show cable video announce-event-profile** *[name <profile-name> | id <#>]* command as given in the following example.

```
Router# show cable video announce-event-profile id 3
ID:3      Name: profile-2
  ACK timeout: 240 seconds
  Number of Event Filters: 10
    2104 4400 4401 5200 5401 5404 5405 5406 5502 5602

  Number of Logical-edge-device: 2
    ID    Name
    -------------------------------------------------------------
    2     led2
    3     led3
```

Configuration Example for Announce Event

This section provides example for the GQI Announce Event Profile configuration.

Example: GQI Announce Event Profile Configuration

```
enable
configure terminal
cable video
  announce-event-profile gqi-led-1 id 2
      ack-timeout 240
      filter 5502
      filter 5602
```

```
logical-edge-device led-1 id 1
   protocol gqi
    event-profile gqi-led-1
    vcg vcg-1
    active
```

Feature Information for Expanded GQI Protocol Support

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 https://cfnng.cisco.com/ 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 Expanded GQI Protocol Support

Feature Name	Releases	Feature Information
Expanded GQI Protocol Support	Cisco IOS XE Everest 16.6.1	This feature was introduced on the Cisco cBR Series Converged Broadband Routers.