Remote PHY BFS QAM Configuration

This document provides information on how to configure Cisco cBR-8 as a Broadcast File System (BFS) Quadrature Amplitude Modulation (QAM), which interfaces with Explorer Controller (EC) versions 7.x and 8.x.

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 BFS QAM Support

The BFS provides a mechanism for a standardized downloading of applications, games, images, and other data formats required by the applications. The BFS QAM enables the router to transfer the broadcast data from an EC to the target platform such as a set-top unit. All forms of BFS data from EC flows as IP multicast, except the CVT carousel, which is through the GQI insert packets.

The BFS QAM configuration on the Cisco cBR-8 router varies based on the version of EC, which interfaces with the router.

- For EC 7.x-Model a GQI-based LED as BFS QAM. One for each LC on Cisco cBR-8.

  For Remote PHY-A single GQI-based LED as BFS QAM for the entire Cisco cBR-8 chassis, as the Cisco cBR-8 can support DEPI multicast for all Remote PHY devices (RPD).

  For EC 8.x-EC 8.x multicasts CVT carousel data in addition to GQI insert packets, but only in the presence of GQAM configured as BFS QAM. Hence, in this setup, a single table-based LED, modeled as BFS QAM, for each Cisco cBR-8 chassis is sufficient. Using cross LC replication, this BFS data can be replicated to other LCs on the Cisco cBR.

How to Configure BFS QAM for EC 7.x

This configuration applies to Cisco cBR-8 routers running Converged Cable Access Platform (CCAP) with Ethernet input and RF output.

If Cisco cBR-8 interacts with EC 7.x, configure an LED on each line card. Use the following procedure to configure BFS QAM on Cisco cBR router.

- Configure an LED with GQI protocol on each line card.
- On EC 7.x, provision BFS QAM.
- Manually create sessions on EC 7.x.
- Generate the QAM, based on GQI model.
- Generate a new source definition and use the new QAM as a target using the same PIDs.
- Ensure that everything is set up on the EC to match the Cisco cBR-8 LED configuration.

This section contains the following:

Mapping Cisco cBR-8 as a GQI QAM

On the EC 7.x, configure BFS sessions on the registered BFS QAM by using one of the following:

- Proprietary Remote Procedure Call (RPC) (with GQAM)
- GQI (with RFGW-1)

You can use a standard GQI model where the sessions will be generated on the individual line card on a single LED per line card basis. Individual BFS sessions are added to the LEDs at the Source Definition for all in-band

BFS sources. Sessions must be unique in numbering and QAM selection, although all other settings must be duplicates of the original settings.

Creating VCG with One QAM Channel

The following example shows how to create a video virtual carrier group (VCG) with one QAM channel, which can carry the BFS data.

```
enable
configure terminal
cable video

virtual-carrier-group (name) id (id)
    service-type broadcast
    rf-channel (rf-channel number 1) tsid (id) output-port-number (port number 1)
  virtual-carrier-group (name 2) id (id 2)
    service-type broadcast
    rf-channel (rf-channel number 1) tsid (id 2) output-port-number (port number 1)
```

Creating SDG for BFS Sessions on Cisco cBR

The following example shows how to create Service Distribution Group (SDG) for BFS sessions and map this to as many RF ports as required.

```
enable
configure terminal
cable video

service-distribution-group sdg_bdcast id 20
    rf-port integrated-cable 8/0/0
    rf-port integrated-cable 8/0/1
    rf-port integrated-cable 8/0/2
    rf-port integrated-cable 8/0/3
    rf-port integrated-cable 8/0/4
    rf-port integrated-cable 8/0/5
    rf-port integrated-cable 8/0/6
    rf-port integrated-cable 8/0/7
  service-distribution-group sdg_bdcast-9 id 21
    rf-port integrated-cable 9/0/0
    rf-port integrated-cable 9/0/1
    rf-port integrated-cable 9/0/2
    rf-port integrated-cable 9/0/3
    rf-port integrated-cable 9/0/4
    rf-port integrated-cable 9/0/5
    rf-port integrated-cable 9/0/6
    rf-port integrated-cable 9/0/7
```

Create VCG for BFS

The following example shows how to create VCG for BFS.

```
configure terminal
cable video

virtual-carrier-group vcg_bdcast id 20
    service-type broadcast
```

```
    rf-channel 76 tsid 1011 output-port-number 1
  virtual-carrier-group vcg_bdcast-9 id 21
    service-type broadcast
    rf-channel 76 tsid 1012 output-port-number 1



vcg vcg_bdcast sdg sdg_bdcast
    vcg vcg_bdcast-9 sdg sdg_bdcast-9

bind-vcg
    vcg vcg_bdcast sdg sdg_bdcast
    vcg vcg_bdcast-9 sdg sdg_bdcast-9
```

Creating Logical Edge Device

The following example shows how to create an LED.

Note Ensure that the LED settings are the same as GQI QAM settings on the EC. For more details, see Creating GQI QAM for BFS on EC 7.x

```
enable
configure terminal
cable video

logical-edge-device led_BFS id 20
    protocol gqi
      mgmt-ip 192.0.2.1
      mac-address <MAC address>
      server 198.51.100.1
      keepalive retry 3 interval 10
      reset interval 8
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_bdcast
      active
  logical-edge-device led_BFS-9 id 21
    protocol gqi
      mgmt-ip 192.0.2.1
      mac-address <MAC address>
      server 198.51.100.1
      keepalive retry 3 interval 10
      reset interval 8
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_bdcast-9
      active
```

Creating GQI QAM for BFS on EC 7.x

Prerequisites

- To create the GQI QAM on the EC, enable packet insertion in the QAM Model.
- You can duplicate the standard RFGW model to ensure that no interference occurs with the current operations.

- The router must have a GQI QAM per LED.
- The individual QAM must be BFS-capable.

Procedure

Use the following procedure to create GQI QAM for BFS.

1. Choose EC > GQI Based QAM Model List > Edit GQI Based QAM.
2. (Optional) Select the BFS Capable checkbox.
3. Choose RF Carriers from the left pane.
4. Ensure that the Carriers and Ethernet Port values are the same as those on the LEDs.

You can create the sessions for each BFS source by generating a Multicast Through GQI Based QAM session through each BFS source's Source Definition.

How to Configure BFS QAM for RPD

This configuration applies to Cisco cBR-8 routers running CCAP with Ethernet input and Ethernet output.

The configuration procedure for RPD is similar to the configuration on Cisco cBR-8 routers with EC 7.x. However, only one LED is needed for BFS QAM configuration.

You can use the sessions configured on the LED on every RPD by defining an Auxiliary Core on each RPD as needed for BFS distribution.

Creating SDG for BFS Sessions for RPD

The following example shows how to create SDG for BFS sessions on RPDs.

```
service-distribution-group sdg_bdcast id 20
    rpd downstream-cable 2/0/30

virtual-carrier-group vcg_bdcast id 20
    service-type broadcast
    rf-channel 79 tsid 1013 output-port-number 1
```

Creating LED for RPD

The following example shows how to create an LED.

```
logical-edge-device led_BFS id 20
    protocol gqi
      mgmt-ip 192.0.2.1
      mac-address <MAC address>
      server 198.51.100.1
      keepalive retry 3 interval 10
      reset interval 8
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_bdcast
```

Defining Cable RPD

The RPD definition must include the RPD defined in the BFS SDG for every RPD to which you want to distribute BFS data: The following example shows how to define RPD.

```
cable rpd RPD07
 identifier xxxx.xxxx.xxxx
  core-interface Te2/1/4
  principal
  rpd-ds 0 downstream-cable 2/0/16 profile 11
  rpd-us 0 upstream-cable 2/0/12 profile 1
 core-interface Te2/1/6
  rpd-ds 0 downstream-cable 2/0/30 profile 10
 r-dti 3
 rpd-event profile 0
 rpd-55d1-us-event profile 0
!
cable rpd RPD08
 identifier xxxx.xxxx.xxxx
 core-interface Te2/1/4
  principal
  rpd-ds 0 downstream-cable 2/0/17 profile 11
  rpd-us 0 upstream-cable 2/0/14 profile 1
 core-interface Te2/1/6
  rpd-ds 0 downstream-cable 2/0/30 profile 10
 r-dti 3
 rpd-event profile 0
 rpd-55d1-us-event profile 0
```

For information on how to create GQI QAM on the EC, see Creating GQI QAM for BFS.

How to Configure BFS QAM for EC 8.x

When Cisco cBR-8 interfaces with EC 8.x, all sessions on the router are configured as multicast and perform a multicast join.

The Cisco cBR routers are not directly mapped on the EC. Hence, this BFS QAM configuration requests and processes the multicast BFS sessions that are setup on the actual BFS QAM. If the Cisco cBR-8 routers have to process these sessions, you must set up table-based multicast sessions, which are similar to the ones available on the BFS QAM.

Configure QAM replication group (QRG), spanning across line cards (LC) to replicate these BFS sessions on every RF port (if each RF port is a service group) of every LC.

To replicate across line cards, you must configure table-based sessions. You can perform cross-line-card-replication only through table-based sessions.

Use the following procedure to configure BFS QAM on Cisco cBR router for EC 8.x.

1. Create a VCG with one QAM channel for carrying this BFS data.
2. Within the same VCG, allocate a few more QAM channels for MPTS pass-through sessions.
3. Create VCG for VoD QAM channels.
4. Create VCG for SDV QAM channels.

Creating VCG for VoD QAM Channels

The following example shows how to create VCG for VoD QAM channels.

```
enable
configure terminal
cable video

virtual-carrier-group vcg_VoD
service-type narrowcast
rf-channel 1-32 tsid 2-33 output-port 2-33
```

Creating VCG for SDV QAM Channels

The following example shows how to create VCG for SDV QAM channels.

```
enable
configure terminal
cable video

virtual-carrier-group vcg_SDV
service-type narrowcast
rf-channel 33-48 tsid 34-49 output-port 34-49
```

Creating SDG

The following procedures are applicable when you create an SDG.

1. Create SDG for broadcast sessions and map this to as many RF ports as required, depending on the Service Groups which need this broadcast data.
2. Create separate SDG for VoD.
3. Create separate SDG for SDV, which probably contains replication.

```
enable
configure terminal
cable video

service-distribution-group sdg_bdcast
  rf-port integrated-cable 1/0/0
  rf-port integrated-cable 1/0/1
  rf-port integrated-cable 2/0/0
  rf-port integrated-cable 2/0/1
  rf-port integrated-cable 3/0/0
  rf-port integrated-cable 3/0/1

service-distribution-group sdg_VoD
  rf-port integrated-cable 1/0/0

service-distribution-group sdg_SDV
  rf-port integrated-cable 1/0/0
  rf-port integrated-cable 1/0/1

bind-vcg
  vcg vcg_BFS sdg sdg_BFS
  vcg vcg_VoD1 sdg sdg_VoD
  vcg vcg_SDV sdg sdg_SDV
```

Creating LEDs

The following procedures are applicable for creating LEDs.

1. Create a table based LED for broadcast carrying BFS and MPTS pass-through sessions.
2. Create separate LEDs for VoD and SDV.

```
logical-edge-device led_BFS id 1
    protocol table-based
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_bdcast
      active
  table-based
    vcg vcg_bdcast
      rf-channel 0
        session BFS group 203.0.113.4 start-udp-port 49152 num-sessions-per-qam 1
processing-type remap start-program 20 bit-rate 300000 jitter 100 vbr
      rf-channel 48 session MPTS_passthru group 203.0.113.5 start-udp-port 49152
num-sessions-per-qam 1 processing-type passthru jitter 100 vbr
      rf-channel 49 session MPTS_passthru group 203.0.113.6 start-udp-port 49152
num-sessions-per-qam 1 processing-type passthru jitter 100 vbr

logical-edge-device led_VoD id 2
    protocol gqi
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_VoD
      active
```

Configuration Example for BFS QAM Configuration

This section provides examples for BFS QAM support.

Example: BFS QAM Configuration on Cisco cBR for EC 7.x

The following example shows the BFS QAM configuration for EC 7.x.

```
virtual-carrier-group vcg_bdcast id 20
    service-type broadcast
    rf-channel 76 tsid 1011 output-port-number 1
  virtual-carrier-group vcg_bdcast-9 id 21
    service-type broadcast
    rf-channel 76 tsid 1012 output-port-number 1

service-distribution-group sdg_bdcast id 20
    rf-port integrated-cable 8/0/0
    rf-port integrated-cable 8/0/1
    rf-port integrated-cable 8/0/2
    rf-port integrated-cable 8/0/3
    rf-port integrated-cable 8/0/4
    rf-port integrated-cable 8/0/5
    rf-port integrated-cable 8/0/6
    rf-port integrated-cable 8/0/7
```

```
  service-distribution-group sdg_bdcast-9 id 21
    rf-port integrated-cable 9/0/0
    rf-port integrated-cable 9/0/1
    rf-port integrated-cable 9/0/2
    rf-port integrated-cable 9/0/3
    rf-port integrated-cable 9/0/4
    rf-port integrated-cable 9/0/5
    rf-port integrated-cable 9/0/6
    rf-port integrated-cable 9/0/7

virtual-carrier-group vcg_bdcast id 20
    service-type broadcast
    rf-channel 76 tsid 1011 output-port-number 1
  virtual-carrier-group vcg_bdcast-9 id 21
    service-type broadcast
    rf-channel 76 tsid 1012 output-port-number 1

vcg vcg_bdcast sdg sdg_bdcast
    vcg vcg_bdcast-9 sdg sdg_bdcast-9

bind-vcg
    vcg vcg_bdcast sdg sdg_bdcast
    vcg vcg_bdcast-9 sdg sdg_bdcast-9

logical-edge-device led_BFS id 20
    protocol gqi
      mgmt-ip 192.0.2.1
      mac-address <MAC address>
      server 198.51.100.1
      keepalive retry 3 interval 10
      reset interval 8
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_bdcast
      active
  logical-edge-device led_BFS-9 id 21
    protocol gqi
      mgmt-ip 192.0.2.1
      mac-address <MAC address>
      server 198.51.100.1
      keepalive retry 3 interval 10
      reset interval 8
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_bdcast-9
      active
```

Example: BFS QAM Configuration on RPD

The following example shows the BFS QAM configuration on RPD.

```
service-distribution-group sdg_bdcast id 20
    rpd downstream-cable 2/0/30

virtual-carrier-group vcg_bdcast id 20
    service-type broadcast
    rf-channel 79 tsid 1013 output-port-number 1

logical-edge-device led_BFS id 20
    protocol gqi
      mgmt-ip 192.0.2.1
      mac-address <MAC address>
      server 198.51.100.1
      keepalive retry 3 interval 10
```

```
      reset interval 8
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_bdcast
cable rpd RPD07
 identifier xxxx.xxxx.xxxx
 core-interface Te2/1/4
  principal
  rpd-ds 0 downstream-cable 2/0/16 profile 11
  rpd-us 0 upstream-cable 2/0/12 profile 1
 core-interface Te2/1/6
  rpd-ds 0 downstream-cable 2/0/30 profile 10
 r-dti 3
 rpd-event profile 0
 rpd-55d1-us-event profile 0
!
cable rpd RPD08
 identifier xxxx.xxxx.xxxx
 core-interface Te2/1/4
  principal
  rpd-ds 0 downstream-cable 2/0/17 profile 11
  rpd-us 0 upstream-cable 2/0/14 profile 1
 core-interface Te2/1/6
  rpd-ds 0 downstream-cable 2/0/30 profile 10
 r-dti 3
 rpd-event profile 0
 rpd-55d1-us-event profile 0
```

Example: BFS QAM Configuration on Cisco cBR for EC 8.x

The following example shows the BFS QAM configuration for EC 8.x.

```
virtual-carrier-group vcg_bdcast
service-type broadcast
rf-channel 0 tsid 1 out 1
rf-channel 49-63 tsid 50-64 output-port 50-64

virtual-carrier-group vcg_VoD
service-type narrowcast
rf-channel 1-32 tsid 2-33 output-port 2-33

virtual-carrier-group vcg_SDV
service-type narrowcast
rf-channel 33-48 tsid 34-49 output-port 34-49


service-distribution-group sdg_bdcast
rf-port integrated-cable 1/0/0
rf-port integrated-cable 1/0/1
rf-port integrated-cable 2/0/0
rf-port integrated-cable 2/0/1
rf-port integrated-cable 3/0/0
rf-port integrated-cable 3/0/1

service-distribution-group sdg_VoD
rf-port integrated-cable 1/0/0

service-distribution-group sdg_SDV
rf-port integrated-cable 1/0/0
rf-port integrated-cable 1/0/1

bind-vcg
vcg vcg_BFS sdg sdg_BFS
```

```
vcg vcg_VoD1 sdg sdg_VoD
vcg vcg_SDV sdg sdg_SDV

logical-edge-device led_BFS id 1
    protocol table-based
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_bdcast
      active
  table-based
    vcg vcg_bdcast
      rf-channel 0
        session BFS group 203.0.113.4 start-udp-port 49152 num-sessions-per-qam 1
processing-type remap start-program 20 bit-rate 300000 jitter 100 vbr
      rf-channel 48
        session MPTS_passthru group 203.0.113.5 start-udp-port 49152 num-sessions-per-qam
1 processing-type passthru jitter 100 vbr
       rf-channel 49
        session MPTS_passthru group 203.0.113.6 start-udp-port 49152 num-sessions-per-qam
1 processing-type passthru jitter 100 vbr

logical-edge-device led_VoD id 2
    protocol gqi
      virtual-edge-input-ip 203.0.113.1 input-port-number 1
      vcg vcg_VoD
      active
```

Feature Information for BFS QAM Configuration

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 BFS QAM Configuration

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