Virtual Combining of Upstream Channels on RPD

This chapter provides information on the support for virtual combining of upstream channels on Cisco Remote PHY Devices.

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 Remote PHY Device

Cisco HFC Platform	Remote PHY Device
Cisco GS7000 Super High Output Node	Cisco 1x2 / Compact Shelf RPD Software 2.1 and Later Releases
Cisco GS7000 Super High Output Intelligent Node (iNode)	Cisco 1x2 / Compact Shelf RPD Software 4.1 and Later Releases Cisco Intelligent Remote PHY Device 1x2 • PID—iRPD-1X2= • PID—iRPD-1X2-PKEY=

Note The -PKEY suffix in the PID indicates units that enable the SCTE-55-2 Out-of-Band protocol support.

Information About Virtual Combining of Upstream Channels

Virtual Combining helps in supporting more RPDs than the number of US SGs, similar to the way multiple physical cables are combined to the same upstream RF port in I-CMTS architecture.

In RPHY, a group of Upstream External PHY Interface (UEPI) sessions with different pseudowires are set up for a single upstream channel for both CCAP core and RPD. However, with virtual-combing, multiple UEPI sessions are mapped to one physical channel in Cisco cBR-8 Routers.

Through this feature, Cisco cBR-8 routers support the binding of multiple US ports on RPDs to the same US controller. The USPHY configuration on the combined RPDs is the same. All combined RPDs must use the same type of USPHY chip.

You are notified if an RPD USPHY is incompatible with the USPHY configuration when a new RPD comes online.

The combined US ports may be in the same RPD. The combined US ports may be in different RPDs. The maximum number of combined US ports to the same controller must not exceed 8. The combined USPHY channels share the bandwidth of the combined channel.

At any instance, only one USPHY channel can transmit. Cisco cBR Series routers support the modems under a specific RPD even in combined US channel cases. It also supports all member USPHY channel information in a combined channel.

When monitoring a physical channel, the cable monitor monitors all member UEPI channels. Spectrum surveillance collects and calculates the SNR and CNR for each USPHY channel.

The OFDMA channels supported for the Virtual Combining feature on Remote PHY start from 8192. The number of ATDMA channels supporting this feature are 256 physical channels for IPHY and 1024 for Remote PHY.

Configure Virtual Combining of Upstream Channels

Configuration Example

This section provides example of how to configure the RPD for virtual combining of upstream channels.

Verify Upstream Virtual Combining Details

To view the spectrum analysis measurements of the specified UEPI channels for virtual combining, use the following sample commands:

```
show cable spectrum-analysis Cable <slot/subslot/port> upstream <port> sid <Sid of modem
or noise> devID <0-7 Device ID>
Load for five secs: 5%/1%; one minute: 5%; five minutes: 5%
No time source, *11:16:00.436 CST Sat Feb 24 2018

Spectrum Analysis Measurements for Cable9/0/7: Upstream 0 Sid 1
Device ID: 1
Channel Center Frequency: 10000 kHz
Frequency Span:          3200 kHz
Number of Bins:          129
Bin Spacing:             25.0 kHz
```

```
Resolution Bandwidth:      42.750 kHz
Amplitude Data:
    Bin   1: -60.00 dBmV
    Bin   2: -60.00 dBmV
    Bin   3: -60.00 dBmV
    Bin   4: -32.00 dBmV
    Bin   5: -23.00 dBmV
    Bin   6: -22.00 dBmV
```

To view the signal quality of the specified channels supporting virtual combining, use the following sample commands:

```
show cable signal-quality cmts
I/F             DevID    CNiR            Expected Received
                         (dB)            Signal Power (dBmV)
Cable1/0/0/U0   0        31.0            0.0
Cable1/0/0/U0   1        31.0            0.0
Cable1/0/0/U0   2        31.0            0.0
Cable1/0/0/U1   0        31.0            0.0
Cable1/0/0/U1   1        31.0            0.0
Cable1/0/0/U2            -----           -----
Cable1/0/0/U3            -----           -----
Cable1/0/0/U4   0        31.0            0.0
Cable1/0/0/U5   0        31.0            0.0
```

To view the status of upstream channel combining, use the following sample commands:

```
show controllers upstream-cable 7/0/62 us-channel 0

Load for five secs: 5%/1%; one minute: 6%; five minutes: 5%
Time source is NTP, 18:05:11.271 CST Tue Feb 27 2018

Controller RPD US Port List:

DevID   RPD ID          US Port  I/F        Name
------  --------------- -------- ---------  ------------
   0    0004.9f03.0226     0     Te7/1/1    0004.9f03.0226
   1    0004.9f03.0286     0     Te7/1/1    0004.9f03.0286
   2    1004.9f30.1500     0     Te7/1/0    1004.9f30.1500
   3    1004.9f30.1500     1     Te7/1/0    1004.9f30.1500

USPHY OFDMA support: NO

Controller 7/0/62 upstream 0  AdminState:UP OpState: UP
  atdma mode enabled
  Frequency 21.800 MHz, Channel Width 1.600 MHz, Symbol Rate 1.280 Msps
  Modulation Profile Group 221
  Modulations (64-QAM) - A-short 64-QAM, A-long 64-QAM, A-ugs 64-QAM

  Mapped to connector 62 and receiver 0
  Bind to Cable7/0/0 US0
  US phy MER(SNR)_estimate for good packets - 42.410 dB
  Spectrum Group is overridden
  Nominal Input Power Level 0 dBmV
  part_id=0x0000, rev_id=0x00, rev2_id=0x00
  Range Load Reg Size=0x58
  Request Load Reg Size=0x0E
  Minislot Size in number of Timebase Ticks is = 4
  Minislot Size in Symbols = 32
  Minislot Size in Bytes = 24

  UCD procedures on lch 0
  UCD ucd-succeed          (3   ) invalid-req          (0   ) md-dispatch          (0   )
```

```
       UCD mismatch-req        (0   ) start-sw              (0   ) start-state         (0   )
       UCD ccc-time            (0   ) end-sw                (0   ) end-state           (0   )
       UCD ucd-lch-tgc         (0   ) ucd-rcvr              (0   ) ucd-cdm-timeout     (0   )
       UCD ucd-no-reqtxn       (0   ) ucd-req-chn-mismatch  (0   ) ucd-send-next-fail  (0   )
       UCD ucd-rpd-np          (0   ) ucd-upd-gcp-msg       (0   ) ucd-cfg-gcp-msg     (0   )
       UCD ucd-gcp-ack         (0   ) ucd-gcp-ack-timeout   (0   ) ucd-gcp-nack        (0   )
       UCD ucd-gcp-timout      (0   ) ucd-ack-err           (0   ) ucd-timer-null      (0   )
       UCD ucd-proxy-timeout   (0   ) ucd-proxy-wrong-ack   (0   )
       PHY: us errors 0  us recoveries 0 (enp 0)
       MAC PHY TSS: tss error start 0  tss error end 0
       MAC PHY Status: mask 0  int_index 0
       PHY: TSS late 0  discontinuous 0
       PHY: TSS mis-match 0  not-aligned 0
       PHY: TSS missed snapshots from phy 0
       Map Counts:0
LCH_state RUN_STEADY   , UCD_count 3, MD 0 chan 0
```

Configure RPD for Virtual Combining

The virtual combining of upstream channels is initiated automatically when users configure the same US controller for more than one US ports. The ports may be in the same RPD or different RPDs, but should be on the same line card).

In the following example, the US port 0 on RPD node_1 and US port 0 and 1 on RPD node_2 are combined to upstream-cable 9/0/2.

```
cable rpd node_<number>
 identifier badb.ad13.5d7e
 core-interface Te9/1/2
  principal
  rpd-ds 0 downstream-cable 9/0/2 profile 100
  rpd-us 0 upstream-cable 9/0/2 profile 221
 r-dti 1
!
cable rpd node_2
 identifier badb.ad13.5d96
 core-interface Te9/1/2
  principal
  rpd-ds 0 downstream-cable 9/0/2 profile 100
  rpd-us 0 upstream-cable 9/0/2 profile 221
  rpd-us 1 upstream-cable 9/0/2 profile 221
 r-dti 1
!
```

Example for Configuring RPD for Virtual Combining

```
cable rpd node_1
 identifier badb.ad13.5d7e
 core-interface Te9/1/2
  principal
  rpd-ds 0 downstream-cable 9/0/2 profile 100
  rpd-us 0 upstream-cable 9/0/2 profile 221
 r-dti 1
!
cable rpd node_2
 identifier badb.ad13.5d96
 core-interface Te9/1/2
```

```
  principal
  rpd-ds 0 downstream-cable 9/0/2 profile 100
  rpd-us 0 upstream-cable 9/0/2 profile 221
  rpd-us 1 upstream-cable 9/0/2 profile 221
 r-dti 1
!
```

Feature Information for Virtual Combining of Upstream Channels

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 2: Feature Information for NIT Reference Support

Feature Name	Releases	Feature Information
Virtual Combining of Upstream Channels on Remote PHY	Cisco 1x2 RPD Software 4.1	This feature was introduced on the Cisco Remote PHY Devices.