



DOCSIS 3.1 OFDM Channel Configuration

This document describes how to configure the OFDM channel on the Cisco cBR Series Converged Broadband Router.

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Hardware Compatibility Matrix for Cisco cBR Series Routers



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

Table 1: Hardware Compatibility Matrix for the Cisco cBR Series Routers

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	<p>Cisco IOS-XE Release 3.15.0S and Later Releases</p> <p>Cisco cBR-8 Supervisor :</p> <ul style="list-style-type: none"> • PID—CBR-CCAP-SUP-160G • PID—CBR-CCAP-SUP-60G¹ • PID—CBR-SUP-8X10G-PIC 	<p>Cisco IOS-XE Release 3.15.0S and Later Releases</p> <p>Cisco cBR-8 CCAP Line Cards:</p> <ul style="list-style-type: none"> • PID—CBR-LC-8D30-16U30 • PID—CBR-LC-8D31-16U30 • PID—CBR-RF-PIC • PID—CBR-RF-PROT-PIC <p>Cisco cBR-8 Downstream PHY Modules:</p> <ul style="list-style-type: none"> • PID—CBR-D30-DS-MOD • PID—CBR-D31-DS-MOD <p>Cisco cBR-8 Upstream PHY Modules:</p> <ul style="list-style-type: none"> • PID—CBR-D30-US-MOD

¹ Effective with Cisco IOS-XE Release 3.17.0S, CBR-CCAP-SUP-60G supports 8 cable line cards. The total traffic rate is limited to 60Gbps, the total number of downstream service flow is limited to 72268, and downstream unicast low-latency flow does not count against the limits.

Information about OFDM Channel Configuration

OFDM Channels

DOCSIS 3.1 introduces modes for higher throughput and higher spectral efficiency while still allowing backward compatibility to DOCSIS 3.0. OFDM Channel support includes one OFDM channel per port with channel bandwidth from 24 MHz to 192 MHz wide.

Each OFDM channel supports a control profile, an NCP profile, and up to five data profiles. Profiles support one or more modulations.

Starting from Cisco IOS-XE release 3.18.1SP, you can configure the guard band of an OFDM channel to potentially trade off some performance margin using command **guardband-override**. By default, Cisco cBR-8 router use the default guard band, which is based on the roll off and spacing in OFDM channel profile.



Note OFDM channel can only be used as secondary channel as part of a Wideband group. Primary channel needs to be configured as normal DOCSIS 3.0 primary RF channel.

Channel Profile

A globally configured OFDM channel profile contains channel parameters, and the modulation or modulation profile associated with the control, NCP, and data profiles.

Each OFDM channel must specify an OFDM channel profile in its configuration.

Modulation Profile

A globally configured OFDM modulation profile assigns different modulations to ranges of sub-carriers, or lists of individual sub-carriers.

A modulation profile may be assigned to a control, NCP, or data profile in a channel profile.

OFDM Channel Exclusion Band

Ranges of frequencies can be excluded from all OFDM channels on a port using the **ofdm-freq-excl-band** command.

How to Configure OFDM Channel

Configuring OFDM Modulation Profile

To configure the OFDM modulation profile, follow the steps below:

```
enable
configure terminal
cable downstream ofdm-modulation-profile id
description text
subcarrier-spacing value
width value
start-frequency value
assign {modulation-default mod_prof_id | modulation mod_prof_id {list-subcarriers
{freq-abs | freq-offset} value | range-subcarriers {freq-abs | freq-offset}
value width value}}
```



Note Subcarrier spacing must match the subcarrier spacing of each channel profile in which it is configured.

Verifying OFDM Modulation Profile Configuration

To display the OFDM modulation profile details, use the **show cable ofdm-modulation-profiles** command as shown in the example below:

```
Router# show cable ofdm-modulation-profile 10

**** OFDM Modulation Profile Configuration ****
```

```

Prof  FFT  Width      Start-freq Modulations
ID   KHz  Hz         Hz
10   50   96000000  627000000  64  default
                               512  freq-abs  709050000 width  12000000
                               2048 freq-abs  629000000 width   6000000

Profile Subcarrier Modulations
Modulation: Start-freq-abs[start-sc] - End-freq-abs[end-sc] Width-freq[num-sc]
64  : 572600000[  0] - 626950000[1087]  54400000[1088]
64  : 627000000[1088] - 628950000[1127]   2000000[ 40]
2048: 629000000[1128] - 634950000[1247]   6000000[ 120]
64  : 635000000[1248] - 709000000[2728]  74050000[1481]
512 : 709050000[2729] - 721000000[2968]  12000000[ 240]
64  : 721050000[2969] - 722950000[3007]   1950000[ 39]
64  : 723000000[3008] - 777350000[4095]  54400000[1088]

**** OFDM Modulation Profile Assigned Channel Profiles ****

```

```

Prof  Channel
ID   Profiles
10   30

```

To display the associations between OFDM modulation profiles and OFDM channel profiles, use the **show cable ofdm-modulation-profile** command with **channel-profiles** option as shown in the example below:

```

Router# show cable ofdm-modulation-profile channel-profiles

**** OFDM Modulation Profile Assigned Channel Profiles ****

Prof  Channel
ID   Profiles
8     None
9     28
10    30
192   192

```

To display the OFDM modulation profile configurations, use the **show cable ofdm-modulation-profile** command with **configuration** option as shown in the example below:

```

Router# show cable ofdm-modulation-profile configuration

**** OFDM Modulation Profile Configuration ****

Prof  FFT  Width      Start-freq Modulations          Description
ID   KHz  Hz         Hz
8     50   192000000  NA          2048 default
                               512  freq-off  48000000
                               width  24000000
9     50   96000000  627000000  512  default          512-1k-4k
                               1024 freq-abs  635000000
                               width  74050000
                               4096 freq-abs  629000000
                               width  6000000
10    50   96000000  627000000  64   default
                               512  freq-abs  709050000
                               width  12000000
                               2048 freq-abs  629000000
                               width  6000000

```

Configuring OFDM Channel Profile

To configure the OFDM channel profile, follow the steps below:

```
enable
configure terminal
cable downstream ofdm-chan-profile id
description text
cyclic-prefix value
guardband-override value
interleaver-depth value
pilot-scaling value
roll-off value
subcarrier-spacing value
profile-ncp modulation-default mod_prof_id
profile-control {modulation-default mod_prof_id | modulation-profile mod_prof_id}
profile-data channel_data_prof_id {modulation-default mod_prof_id |
modulation-profile mod_prof_id}
```

Verifying OFDM Channel Profile Configuration

To display the OFDM channel profile details, use the **show cable ofdm-chan-profiles** command as shown in the example below:

```
Router# show cable ofdm-chan-profile 21
**** OFDM Channel Profile Configuration ****

Prof  Cycl  Roll  Guardband  FFT  Intr  Pilot  Modulation (D-Default, P-Profile)
ID    Prfx  Off   Override   KHz  Depth  Scale  Cntrl   NCP    Data Profiles (count = 0)
      5
21    1024  128   2400000    50   16     48     D:1024  D:16   NA     NA     NA     NA
      NA

**** OFDM Channel Profile Assigned Channels ****

Prof  Admin  Controller:channels
ID
21    Up     6/0/4:158
```

To display the associations between OFDM channel profiles and OFDM channels, use the **show cable ofdm-chan-profiles** command with **channels** option as shown in the example below:

```
Router# show cable ofdm-chan-profile channels
**** OFDM Channel Profile Assigned Channels ****

Prof  Admin  Controller:channels
ID
20    Up     3/0/1:158           3/0/2:158           3/0/3:158           3/0/5:158
      3/0/6:158           3/0/7:158
30    Up     3/0/4:158
101   Up     3/0/0:158
```

To display the OFDM channel profile configurations, use the **show cable ofdm-chan-profiles** command with **configuration** option as shown in the example below:

```
Router# show cable ofdm-chan-profile configuration
```

```
**** OFDM Channel Profile Configuration ****
```

Prof	Cycl	Roll	Guardband	FFT	Intr	Pilot	Modulation (D-Default, P-Profile)					
ID	Prfx	Off	Override	KHz	Depth	Scale	Cntrl	NCP	Data Profiles			
			(Limited to 20)						1	2	3	4
0	5 1024 NA	128	NA	50	16	48	D:256	D:16	D:1024	NA	NA	NA
1	1024 NA	128	NA	50	16	48	D:256	D:16	D:2048	D:1024	NA	NA
2	1024 NA	128	NA	50	16	48	D:256	D:16	D:4096	D:2048	D:1024	NA
3	1024 D:1024	128	NA	50	16	48	D:256	D:16	P:0	D:4096	D:2048	
4	1024 D:2048	128	NA	50	16	48	D:256	D:16	D:512	P:0	D:4096	
5	1024 NA	128	NA	25	16	48	D:256	D:16	D:1024	NA	NA	NA
6	1024 NA	128	NA	25	16	48	D:256	D:16	D:2048	D:1024	NA	NA
7	1024 NA	128	NA	25	16	48	D:256	D:16	D:4096	D:2048	D:1024	NA
8	1024 D:1024	128	NA	25	16	48	D:256	D:16	P:1	D:4096	D:2048	
9	1024 D:2048	128	NA	25	16	48	D:256	D:16	D:512	P:1	D:4096	
20	1024 NA	128	NA	50	16	48	D:1024	D:16	NA	NA	NA	NA
21	1024 NA	128	1000000	50	16	48	D:1024	D:16	NA	NA	NA	NA

Configuring Port/Controller and Channel

To configure the port/controller and channel, follow the steps below:

```
enable
configure terminal
controller integrated-cable slot/subslot/port
max-ofdm-spectrum value
ofdm-freq-excl-band start-frequency value width value
rf-chan start_id [end_id]
ofdm channel-profile id start-frequency value width value [plc value]
```



Note The range of *start_id* is 158 to 162 in the OFDM channel configuration.

The maximum OFDM spectrum is assigned to OFDM channels, which is used by the the CMTS to calculate default port base power.

Ranges of frequencies can be excluded from all OFDM channels using the **ofdm-freq-excl-band** command.

Verifying Port/Controller and Channel Configuration

To display the RF port details, use the **show controller integrated-cable** command with **rf-port** option as shown in the example below:

```
Router# show controller integrated-cable 3/0/0 rf-port

Admin: UP MaxCarrier: 128 BasePower: 33 dBmV Mode: normal
Rf Module 0: UP
Free freq block list has 3 blocks:
 45000000 - 107999999
 624000000 - 644999999
 837000000 - 1217999999
Rf Port Status: UP
MaxOfdmSpectrum: 192000000 Equivalent 6MHz channels: 32
UsedOfdmSpectrum: 192000000 AvailOfdmSpectrum: 0
DefaultBasePower: 33 dBmV Equivalent 6MHz channels: 160
OFDM frequency exclusion bands: None
```

To display the summary information on OFDM channel, use the **show controller integrated-cable** command with **rf-channel** option as shown in the example below:

```
Router# show controller integrated-cable 3/0/0 rf-port 158

Chan State Admin Mod-Type Start Width PLC Profile-ID dcid power
output
Frequency
 158 UP UP OFDM 627000000 96000000 663000000 20 159 34
NORMAL
```

To display detailed information on OFDM channel, use the **show controller integrated-cable** command with **rf-channel** and **verbose** options as shown in the example below:

```
Router# show controller integrated-cable 3/0/0 rf-port 158 verbose

Chan State Admin Mod-Type Start Width PLC Profile-ID dcid power
output
Frequency
 158 UP UP OFDM 627000000 96000000 663000000 30 159 32
NORMAL
Resource status: OK
License: granted <17:02:35 EDT May 18 2016>
OFDM channel license spectrum width: 92200000
OFDM modulation license (spectrum width): 2K (6000000)
OFDM config state: Configured

OFDM channel details: [3/0/4:158]
-----
OFDM channel frequency/subcarrier range : 627000000[1088] - 722999999[3007]
OFDM spectrum frequency/subcarrier range : 572600000[ 0] - 777399999[4095]
Active spectrum frequency/subcarrier range : 628900000[1126] - 721049999[2969]
OFDM channel center frequency/subcarrier : 675000000[2048]
PLC spectrum start frequency/subcarrier : 663000000[1808]
PLC frequency/subcarrier : 665800000[1864]
Channel width : 96000000
Active Channel width : 92200000
OFDM Spectrum width : 204800000
Chan prof id : 30
Cyclic Prefix : 1024
Roll off : 128
Interleave depth : 16
Spacing : 50KHZ
```

Verifying Port/Controller and Channel Configuration

```

Pilot Scaling                               : 48
Control modulation profile                  : 10
NCP modulation default                      : 16
Data modulation default                    : None
Data modulation profile                    : None
Lower guardband width in freq/subcarriers   : 1900000[38]
Upper guardband width in freq/subcarriers   : 1900000[38]
Licensed 4K modulation spectrum width      : 0
Licensed 2K modulation spectrum width      : 6000000

PLC spectrum frequencies [subcarriers]      :
663000000[1808] - 668999999[1927]

PLC channel frequencies [subcarriers]      :
665800000[1864] - 666199999[1871] Size: 8 subcarriers

Excluded frequencies [subcarriers]        :
572600000[ 0] - 628899999[1125] 721100000[2970] - 777399999[4095]
Count: 2252

Pilot frequencies [subcarriers]           :
*:PLC pilots
630700000[1162] 634300000[1234] 637900000[1306] 641500000[1378]
645100000[1450] 648700000[1522] 652300000[1594] 655900000[1666]
659500000[1738] 663450000[1817]* 664050000[1829]* 664600000[1840]*
665050000[1849]* 666900000[1886]* 667350000[1895]* 667900000[1906]*
668500000[1918]* 669100000[1930] 672700000[2002] 676300000[2074]
679900000[2146] 683500000[2218] 687100000[2290] 690700000[2362]
694300000[2434] 697900000[2506] 701500000[2578] 705100000[2650]
708700000[2722] 712300000[2794] 715900000[2866] 719500000[2938]
Count: 32

Active frequencies [subcarriers]          :
628900000[1126] - 721099999[2969]
Count: 1844

Data frequencies [subcarriers]            :
628900000[1126] - 630699999[1161] 630750000[1163] - 634299999[1233]
634350000[1235] - 637899999[1305] 637950000[1307] - 641499999[1377]
641550000[1379] - 645099999[1449] 645150000[1451] - 648699999[1521]
648750000[1523] - 652299999[1593] 652350000[1595] - 655899999[1665]
655950000[1667] - 659499999[1737] 659550000[1739] - 663449999[1816]
663500000[1818] - 664049999[1828] 664100000[1830] - 664599999[1839]
664650000[1841] - 665049999[1848] 665100000[1850] - 665799999[1863]
666200000[1872] - 666899999[1885] 666950000[1887] - 667349999[1894]
667400000[1896] - 667899999[1905] 667950000[1907] - 668499999[1917]
668550000[1919] - 669099999[1929] 669150000[1931] - 672699999[2001]
672750000[2003] - 676299999[2073] 676350000[2075] - 679899999[2145]
679950000[2147] - 683499999[2217] 683550000[2219] - 687099999[2289]
687150000[2291] - 690699999[2361] 690750000[2363] - 694299999[2433]
694350000[2435] - 697899999[2505] 697950000[2507] - 701499999[2577]
701550000[2579] - 705099999[2649] 705150000[2651] - 708699999[2721]
708750000[2723] - 712299999[2793] 712350000[2795] - 715899999[2865]
715950000[2867] - 719499999[2937] 719550000[2939] - 721099999[2969]
Count: 1804

Profiles:
Number of profiles: 2
CTRL profile (Profile A): rate: 461916 kbps, usable rate: 368000 kbps
Active frequencies [subcarriers]:
Modulation:Start-freq[start-subcarrier] - End-freq[end-subcarrier]
-----
64 :628900000[1126] - 628950000[1127] 2048 :629000000[1128] - 630650000[1161]
2048 :630750000[1163] - 634250000[1233] 2048 :634350000[1235] - 634950000[1247]

```



```

64 :635000000[1248] - 637850000[1305]    64 :637950000[1307] - 641450000[1377]
64 :641550000[1379] - 645050000[1449]    64 :645150000[1451] - 648650000[1521]
64 :648750000[1523] - 652250000[1593]    64 :652350000[1595] - 655850000[1665]
64 :655950000[1667] - 659450000[1737]    64 :659550000[1739] - 663400000[1816]
64 :663500000[1818] - 664000000[1828]    64 :664100000[1830] - 664550000[1839]
64 :664650000[1841] - 665000000[1848]    64 :665100000[1850] - 665750000[1863]
64 :666200000[1872] - 666850000[1885]    64 :666950000[1887] - 667300000[1894]
64 :667400000[1896] - 667850000[1905]    64 :667950000[1907] - 668450000[1917]
64 :668550000[1919] - 669050000[1929]    64 :669150000[1931] - 672650000[2001]
64 :672750000[2003] - 676250000[2073]    64 :676350000[2075] - 679850000[2145]
64 :679950000[2147] - 683450000[2217]    64 :683550000[2219] - 687050000[2289]
64 :687150000[2291] - 690650000[2361]    64 :690750000[2363] - 694250000[2433]
64 :694350000[2435] - 697850000[2505]    64 :697950000[2507] - 701450000[2577]
64 :701550000[2579] - 705050000[2649]    64 :705150000[2651] - 708650000[2721]
64 :708750000[2723] - 709000000[2728]    512 :709050000[2729] - 712250000[2793]
512 :712350000[2795] - 715850000[2865]    512 :715950000[2867] - 719450000[2937]
512 :719550000[2939] - 721000000[2968]    64 :721050000[2969] - 721050000[2969]
Active subcarrier count: 1804, ZBL count: 0
Discontinuity time [days:hours:mins:secs]: 00:00:54:32 [16:15:02 EDT May 18 2016]
    
```

NCP profile:

Active frequencies [subcarriers]:

Modulation:Start-freq[start-subcarrier] - End-freq[end-subcarrier]

```

-----
16 :628900000[1126] - 630650000[1161]    16 :630750000[1163] - 634250000[1233]
16 :634350000[1235] - 637850000[1305]    16 :637950000[1307] - 641450000[1377]
16 :641550000[1379] - 645050000[1449]    16 :645150000[1451] - 648650000[1521]
16 :648750000[1523] - 652250000[1593]    16 :652350000[1595] - 655850000[1665]
16 :655950000[1667] - 659450000[1737]    16 :659550000[1739] - 663400000[1816]
16 :663500000[1818] - 664000000[1828]    16 :664100000[1830] - 664550000[1839]
16 :664650000[1841] - 665000000[1848]    16 :665100000[1850] - 665750000[1863]
16 :666200000[1872] - 666850000[1885]    16 :666950000[1887] - 667300000[1894]
16 :667400000[1896] - 667850000[1905]    16 :667950000[1907] - 668450000[1917]
16 :668550000[1919] - 669050000[1929]    16 :669150000[1931] - 672650000[2001]
16 :672750000[2003] - 676250000[2073]    16 :676350000[2075] - 679850000[2145]
16 :679950000[2147] - 683450000[2217]    16 :683550000[2219] - 687050000[2289]
16 :687150000[2291] - 690650000[2361]    16 :690750000[2363] - 694250000[2433]
16 :694350000[2435] - 697850000[2505]    16 :697950000[2507] - 701450000[2577]
16 :701550000[2579] - 705050000[2649]    16 :705150000[2651] - 708650000[2721]
16 :708750000[2723] - 712250000[2793]    16 :712350000[2795] - 715850000[2865]
16 :715950000[2867] - 719450000[2937]    16 :719550000[2939] - 721050000[2969]
Active subcarrier count: 1804, ZBL count: 0
    
```

CCCs:

OCD CCC: 2

DPD CCCs:

Control profile (Profile A) CCC: 2

NCP profile CCC: 2

Resource config time taken: 2286 msec

JIB channel number: 776

Chan	Pr	EnqQ	Pipe	RAF	SyncTmr	DqQ	ChEn	RAF	Pipe	Phy0	Phy1	Tun#	SessId	0[TkbRt	MaxP]
776	0	384	1	725	0	384	0100	13032	1	0	1	2	0	479610000	4485120
1[TkbRt MaxP]															
383688000	4485120														
776	1	384	1	4786	0	384	0100	2190	1	0	1	2	0	479610000	4485120
383688000 4485120															
776	2	384	1	4786	0	384	0100	2190	1	0	1	2	0	479610000	4485120
383688000 4485120															
776	3	384	1	4786	0	384	0100	2190	1	0	1	2	0	479610000	4485120
383688000 4485120															
776	4	384	1	4786	0	384	0100	2190	1	0	1	2	0	479610000	4485120
383688000 4485120															

```

776 5 384 1 4786 0 384 0100 2190 1 0 1 2 0 479610000 4485120
383688000 4485120
776 6 384 1 4786 0 384 0100 2190 1 0 1 2 0 479610000 4485120
383688000 4485120
776 7 384 1 0 0 384 0100 0 1 0 1 2 0 479610000 4485120
383688000 4485120

```

```

Chan Qos-Hi Qos-Lo Med-Hi Med-Lo Low-Hi Low-Lo
776 368640 245760 368640 245760 614400 368640
Chan Med Low TB-neg Qos_Exc Med_Xof Low_Xof Qdrops(H-M-L) Pos Qlen(Hi-Med-lo) Fl
Tgl_cnt Rdy_sts
776 0 0 0 0 0 0 0 0 0 Y 0 0 0 0
0 ff

```

```

Chan Rate Neg Pos LastTS CurrCr Pos [PLC Rate Neg Pos]
776 10485750 65535 65535 116199669 268431360 Y [MM 86 128 1114][EM 87 128 6204][TR 2
9 3102]

```

DSPHY Info:

```

Local rf port 0 , rf chan 158 pic loss 123
non short CWS: = 235681130, shorts = 0, stuff bytes = 235639172 bch 235681130
NCP msgs: = 453809753, PLC encodings = 16902476
flow0 rcv 70203 flow1 rcv 3 flow0 drops 0 flow1 drops 0

```

Example: Configuring OFDM Channel



Note The OFDM modulation profile must be configured before the OFDM channel profile which references it.

The following example shows how to configure OFDM channel:

```

enable
configure terminal
cable downstream ofdm-modulation-profile 9
description 512-1k-4k
subcarrier-spacing 50KHz
width 96000000
start-frequency 627000000
assign modulation-default 512-QAM
assign modulation 1024-QAM range-subcarriers freq-abs 635000000 width 74050000
assign modulation 4096-QAM range-subcarriers freq-abs 629000000 width 6000000
exit
configure terminal
cable downstream ofdm-chan-profile 20
description Data profiles: 2 single mod, 1 mixed mod
cyclic-prefix 192
interleaver-depth 16
pilot-scaling 48
roll-off 128
subcarrier-spacing 50KHz
profile-ncp modulation-default 16-QAM
profile-control modulation-default 256-QAM
profile-data 1 modulation-default 1024-QAM
profile-data 2 modulation-default 2048-QAM

```

```

profile-data 3 modulation-profile 9
exit
configure terminal
controller integrated-cable 3/0/0
max-ofdm-spectrum 96000000
ofdm-freq-excl-band start-frequency 683000000 width 10000000
rf-chan 158
power-adjust 0
docsis-channel-id 159
ofdm channel-profile 20 start-frequency 627000000 width 96000000 plc 663000000

```

Additional References

Related Document

Document Title	Link
Cisco cBR Converged Broadband Routers Layer 2 and DOCSIS 3.0 Configuration Guide	http://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_cbr_layer2_docsis30.html

MIBs

MIBs	MIBs Link
• DOCSIF31-MIB	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/support

Feature Information for DOCSIS 3.1 OFDM Channel Configuration

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://tools.cisco.com/ITDIT/CFN/>. An account on <http://www.cisco.com/> is not required.



Note The below table 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 DOCSIS 3.1 OFDM Channel Configuration

Feature Name	Releases	Feature Information
DOCSIS 3.1 OFDM Channel Support	Cisco IOS-XE Release 3.18.0SP	This feature was introduced on the Cisco cBR Series Converged Broadband Router s.
Full Spectrum 108-1218 MHz Support	Cisco IOS-XE Release 3.18.0SP	This feature was introduced on the Cisco cBR Series Converged Broadband Router s.
DOCSIS 3.1 Downstream OFDMA Guardband Enhancements	Cisco IOS-XE Release 3.18.1SP	This feature was introduced on the Cisco cBR Series Converged Broadband Router s.