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cable l2vpn

To enable the Ethernet Layer 2 Virtual Private Network (L2VPN) service and enter L2VPN configuration mode, use the **cable l2vpn** command in global configuration mode. To disable this configuration, use the **no** form of this command.

```
cable l2vpn mac-address [customer-name]  
no cable l2vpn mac-address [customer-name]
```

Syntax Description	
<i>mac-address</i>	MAC address of a CM.
<i>customer-name</i>	(Optional) Customer name. Only 0-9, a-z, A-Z, ., -, _, can be used as the customer name.

Command Default None

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(33)SCC	This command was introduced in Cisco IOS Release 12.2(33)SCC.
	IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Examples

The following example shows how to enable the Ethernet L2VPN service and enter L2VPN configuration mode:

```
Router# configure terminal  
Router(config)# cable l2vpn 0000.396e.6a68 customer1  
Router(config-l2vpn)#
```

Related Commands	Command	Description
	service instance	Specifies an Ethernet service instance for a particular customer.

cable l2-vpn-service atm-vc

To enable the use of Layer 2 tunnels for the Customer Premises Equipment (CPE) traffic that is behind cable modems so that individual CPE traffic can be routed to a particular permanent virtual connection (PVC) on an Asynchronous Transfer Mode (ATM) interface, use the **cable l2-vpn-service atm-vc** command in global configuration mode. To disable the use of Layer 2 tunneling, use the **no** form of this command.

cable l2-vpn-service atm-vc
no cable l2-vpn-service atm-vc

Syntax Description

This command has no arguments or keywords.

Command Default

The use of Layer 2 tunneling for ATM PVC mapping is disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(11)BC3	This command was introduced for Cisco uBR7100 series and Cisco uBR7200 series routers.
12.3BC	This command was integrated into Cisco IOS Release 12.3BC.
12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.
IOS-XE 3.15.0S	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

This command enables the use of Layer 2 tunnels on all cable and ATM interfaces in the router—which in turn allows you to map cable modems, on the basis of their hardware (MAC) addresses, to particular PVCs on an ATM interface—using the **cable vc-map** command.

Examples

The following example shows how to enable the use of Layer 2 tunnels on a router so that cable modems can be mapped to particular PVCs on an ATM interface:

```
Router# config terminal
Router(config)# cable l2-vpn-service atm-vc
```

Related Commands

Command	Description
cable vc-map	Maps a cable modem to a particular PVC on an ATM interface.
debug cable l2-vpn	Displays debugging messages for the Layer 2 mapping of cable modems to a particular PVC on an ATM interface.
show cable l2-vpn vc-map	Displays the mapping of one or all cable modems to PVCs on the ATM interfaces.

cable l2-vpn-service default-nsi



Note Effective with Cisco IOS Release 12.2(33)SCC, the **cable l2-vpn-service default-nsi** command is replaced by the **cable l2-vpn-service xconnect** command. See the **cable l2-vpn-service xconnect** command for more information.

To configure an Ethernet Network System Interface (NSI) for Layer 2 VPN support over cable, use the **cable l2-vpn-service default-nsi** command in global configuration mode. To remove the interface, use the **no** form of this command.

cable l2-vpn-service default-nsi *type number*
no cable l2-vpn-service default-nsi *type number*

Syntax Description

<i>type</i>	Interface type. See the <i>Usage Guidelines</i> section for supported types.
<i>number</i>	Interface or subinterface number. For more information about the numbering syntax for your networking device, use the question mark (?) online help function.

Command Default

No NSI interface is configured.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCA	This command was introduced.
12.2(33)SCC	This command was replaced by the cable l2-vpn-service xconnect command.
IOS-XE 3.15.0S	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The Cisco CMTS routers support only the configuration of a single L2VPN NSI per CMTS.

This command supports the following interface types:

- Cisco uBR100012 Universal Broadband Router—Gigabit Ethernet.
- Cisco uBR7246VXR Universal Broadband Router—Fast Ethernet or Gigabit Ethernet

Examples

The following example configures the Gigabit Ethernet line card located in slot 4/0/0 as an NSI for L2VPN using global configuration mode:

```
cable l2-vpn-service default-nsi GigabitEthernet4/0/0
```

Related Commands

Command	Description
show cable l2-vpn dot1q-vc-map	Displays the mapping of one or all cable modems to IEEE 802.1Q VLANs on the router's Ethernet interfaces.

cable l2-vpn-service dot1q

To enable the use of Layer 2 tunnels so that traffic for individual cable modems can be routed over a particular Virtual Local Area Network (VLAN), use the **cable l2-vpn-service dot1q** command in global configuration mode. To disable the use of Layer 2 tunneling, use the **no** form of this command.

cable l2-vpn-service dot1q
no cable l2-vpn-service dot1q

Syntax Description This command has no arguments or keywords.

Command Default Layer 2 tunneling is disabled.

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(15)BC2	This command was introduced for Cisco uBR7246VXR universal broadband routers.
	IOS-XE 3.15.0S	This command was replaced by the cable l2-vpn-service xconnect nsi dot1q command on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines This command enables the use of Layer 2 tunnels, using IEEE 802.1Q VLAN tagging, on all cable interfaces in the router. This in turn allows you to map traffic to and from cable modems, on the basis of the modems'™ hardware (MAC) addresses, to a particular VLAN on a particular WAN interface, using the **cable dot1q-vc-map** command.

Examples The following example shows how to enable the use of IEEE 802.1Q Layer 2 tunnels on a router so that cable modems can be mapped to particular VLAN:

```
Router# config terminal
Router(config)# cable l2-vpn-service dot1q
Router(config)#
```

The following example shows how to disable the use of IEEE 802.1Q Layer 2 tunnels on a router. All mapping of cable modems to IEEE 802.1Q VLANs is halted (but any other Layer 2 mapping, such as the mapping of cable modems to ATM PVCs, is unaffected).

```
Router# config terminal
Router(config)# no cable l2-vpn-service dot1q
Router(config)#
```

Related Commands

Command	Description
cable dot1q-vc-map	Maps a cable modem to a particular Virtual Local Area Network (VLAN) on a local outbound Ethernet interface.
debug cable l2-vpn	Displays debugging messages for the Layer 2 mapping of cable modems to particular PVCs or VLANs.
show cable l2-vpn dot1q-vc-map	Displays the mapping of one or all cable modems to IEEE 802.1Q Virtual Local Area Networks (VLANs) on the router's Ethernet interfaces.

cable l2-vpn-service xconnect

To enable Multiprotocol Label Switching (MPLS) tunnel traffic on the network side interface to support configuration of MPLS pseudowires for L2VPN service, use the **cable l2-vpn-service xconnect** command in global configuration mode. To disable this configuration, use the **no** form of this command.

```

cable l2-vpn-service xconnect nsi { dot1q | mpls }
no cable l2-vpn-service xconnect nsi { dot1q | mpls }
cable l2-vpn-service xconnect nsi dot1q interface ethernet-interface
no cable l2-vpn-service xconnect nsi dot1q interface ethernet-interface
cable l2-vpn-service xconnect nsi dot1q interface ethernet-interface backup-interface ethernet-interface
no cable l2-vpn-service xconnect nsi dot1q interface ethernet-interface backup-interface
ethernet-interface
cable l2-vpn-service xconnect { extended-mtu | mtu-auto-negotiation }

```

Syntax Description

nsi	Specifies the network side interface (NSI).
dot1q	Specifies the usage of DOT1Q tunneling on the NSI for Ethernet L2VPN traffic.
mpls	Specifies the usage of MPLS tunneling on the NSI for Ethernet L2VPN traffic.
backup-interface	Specifies the backup WAN interface.
extended-mtu	Specifies a global MTU used by all D31 CMs to negotiate VC.
mtu-auto-negotiation	Enables the capability to match the remote MTU in VC negotiation, as long as the remote VC is not higher than the CM's capability. It overrides extended-mtu.

Command Default

None

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCC	This command was introduced in Cisco IOS Release 12.2(33)SCC.
IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.
12.2(33)SCJ	This command was modified. The backup-interface keyword was added.
IOS-XE 3.18.0S	This command was modified. The backup-interface keyword was added.
IOS-XE 17.3.1x	This command was modified. The mtu-auto-negotiation keyword was added.

Usage Guidelines

You must enable MPLS tunnel traffic on the network side interface using the **cable l2-vpn-service xconnect** command before provisioning MPLS pseudowires.

Examples

The following example shows how to enable the use of Layer 2 tunnels based on an AToM pseudowire on the Cisco uBR10012 router:

```
Router# configure terminal
Router(config)# cable l2-vpn-service xconnect nsi mpls
```

The following example shows how to configure an ethernet interface on DOT1Q L2VPN on the Cisco CMTS router:

```
Router# configure terminal
Router(config)# cable l2-vpn-service xconnect nsi dot1q interface Te4/0/1
```

The following example shows how to configure a backup WAN interface on DOT1Q L2VPN on the Cisco CMTS router:

```
Router# configure terminal
Router(config)# cable l2-vpn-service xconnect nsi dot1q interface Te4/0/2 backup-interface Te4/0/3
```

The following example shows how to configure a global MTU used by all D31 CMs:

```
Router# configure terminal
Router(config)# cable l2-vpn-service xconnect extended-mtu ?
<1500-2000> Customized MTU
<cr> <cr>
```

The following example shows how to configure arbitrary Maximum Transmission Unit (MTU) for each D3.1 modem differently. This auto-negotiates the set up of L2VPN pseudowire automatically:

```
Router# configure terminal
Router(config)# cable l2-vpn-service xconnect mtu-auto-negotiation
<cr> <cr>
Router# show mpls l2transport vc 235 detail | in MTU
      MTU: local 1700, remote 1700 ..... CM default MTU 2000, remote MTU 1700, CBR
will set CM MTU to 1700
```

Related Commands

Command	Description
cable l2vpn	Enables the Ethernet Layer 2 Virtual Private Network (L2VPN).

cable l2-vpn-service xconnect nsi dot1q interface port-channel

To configure the port-channel uplink port for DOCSIS L2VPN, use the **cable l2-vpn-service xconnect nsi dot1q interface port-channel** command in global configuration mode.

cable l2-vpn-service xconnect nsi dot1q interface port-channel *number*

Syntax Description

number Port-channel interface number.

Command Default

None.

Command Modes

Global configuration (config)

Command History

Release	Modification
IOS-XE 3.18.0S	This command was introduced on Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The **cable l2-vpn-service xconnect nsi dot1q interface port-channel** command configures the port-channel uplink port for DOCSIS L2VPN.

The following example shows how to configure the port-channel uplink port for DOCSIS L2VPN:

```
router# configure terminal
router (config) #cable l2-vpn-service xconnect nsi dot1q interface port-channel
64
```

cable l2-vpn dot1q-nsi-redundancy force-switchover

This command is designed for uplink redundancy feature, which allows you to configure a backup Network System Interface(NSI) interface and a default primary interface for dot1q L2VPN. When the primary NSI interface goes down, the backup NSI interface takes over and the traffic flows through the second interface.

When two uplink DOT1Q Ethernet NSI ports are UP, to manually switch over traffic flows from current active NSI port to another, use the **cable l2-vpn dot1q-nsi-redundancy force-switchover** command in privileged EXEC mode.

cable l2-vpn dot1q-nsi-redundancy force-switchover from *active-nsi*

Syntax Description	<i>active-nsi</i> Specifies the active NSI.
---------------------------	---

Command Default	The current active uplink NSI port is not changed.
------------------------	--

Command Modes	Privileged EXEC(#)
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Command History	Release	Modification
	12.2(33) SCJ	This command was introduced on the Cisco uBR Series Universal Broadband Routers
	IOS-XE 3.18.0S	This command was introduced on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

- This feature is applicable only for DOT1Q L2VPN and not Multiprotocol Label Switching (MPLS) L2VPN.
- This feature is configurable when both the DOT1Q NSI ports are UP.

The following example shows how to manually switch over active uplink NSI port from current active uplink port to the specified port:

```
Router# cable l2-vpn dot1q-nsi-redundancy force-switchover from Te4/0/1
```

Related Commands

Command	Description
show cable l2-vpn dot1q-nsi-redundancy	Displays the backup pair details and the current active uplink DOT1Q NSI port.

xconnect backup force-switchover

To manually force a switchover to a pseudowire peer, use the **xconnect backup force-switchover** command in privileged EXEC mode.

xconnect backup force-switchover peer *ip-address vcid*

Syntax Description	<p>peer <i>ip-address vcid</i> Specifies the IP address and virtual circuit (VC) ID of the pseudowire to be used for the switchover.</p> <ul style="list-style-type: none"> • <i>ip-address</i>—IP address of the peer pseudowire. • <i>vcid</i>—Virtual circuit address of the peer pseudowire.
---------------------------	---

Command Default The pseudowire is not changed.

Command Modes Privileged EXEC (#)

Command History	Release	Modification
	12.2(33)SCF	This command was introduced.
	IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines You can perform a switchover only to an available member in the redundancy group. That is, if the member being specified in the **xconnect backup force-switchover** command is not available, the command will be rejected.

Examples The following example shows how to manually switchover to a peer router.

```
Router# xconnect backup force-switchover peer 10.10.1.1 123
```

Related Commands	Command	Description
	backup delay	Specifies how long a backup pseudowire VC should wait before taking over after the primary pseudowire VC goes down.
	backup peer	Configures a redundant peer for a pseudowire VC.
	show cable l2vpn xconnect	Displays information about the mapping between a Multiprotocol Label Switching (MPLS) pseudowire and its VCs.
	show mpls l2transport vc	Displays information about Any Transport over MPLS (AToM) VCs and static pseudowires that have been enabled to route Layer 2 packets on a router
	show xconnect all	Displays information about xconnect attachment circuits and pseudowires.

cable I3-mobility

To enable mobility for a particular IPv4 or IPv6 subnet, use the **cable I3-mobility** command in bundle or sub-bundle interface mode. To disable mobility, use the no form of this command.

cable I3-mobility {IPv4-address mask IPv6 prefix}

nocable I3-mobility { IPv4-address mask IPv6 prefix}

Syntax Description

<i>IPv4-address</i>	Specifies the IPv4 address of a CPE for which the mobility has to be enabled.
<i>IPv6 prefix</i>	Specifies the IPv6 prefix associated with a particular SAV group, specified in the X:X:X:X::/X format.
<i>mask</i>	Specifies the subnet mask for which the mobility has to be enabled.

Command Default

The mobility of the IP address is disabled.

Command Modes

Bundle interface configuration (config-if)

Bundle sub-interface configuration (config-subif)

Command History

Release	Modification
12.2(33)SCH2	This command was introduced.
IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

Mobility subnets should match with the IPv4 or IPv6 address configured on the bundle or sub-bundle interface.

If the IPv4 or IPv6 address does not match, the following warning message is displayed:

```
Mobility IP should match the IDB subnet!
```

If you remove the IPv4 or IPv6 address from the interface, the mobility scope is removed for the IP address and the following warning message is displayed.

```
IPv6 2001:40:3:111::1 removed from Mobility subnets on Bundle1
```

Examples

The following example shows how to enable the mobility for a particular IPv4 or IPv6 subnet in a bundle interface:

```
Router# configure terminal
Router(config)# interface Bundle 1
Router(config-if)#cable I3-mobility 192.173.82.1 255.255.255.0
```

The following example shows how to enable the mobility for a particular IPv4 or IPv6 subnet in a sub-bundle interface:

```
Router# configure terminal
```

```
Router(config)# interface Bundle 1
Router(config-if)#cable cable l3-mobility 192.173.82.1 255.255.255.0
```

Related Commands

Command	Description
show cablebundle	Displays the details of the cable bundle.
service divert-limitl3-mobility-counter	Sets the layer 3 mobility threshold limit.

cable lcha partial-service-reset-timer

Some Docsis 3.1 cable modems enter partial service mode (downstream or upstream) after LCHA. To configure a timer that starts running after LCHA is complete to reset any Docsis 3.1 cable modems that are in partial service mode after the line card switchover, use the **cable lcha partial-service-reset-timer** command in global configuration mode. To disable this feature, use the **no** form of this command.

cable lcha partial-service-reset-timer *time*
no cable lcha partial-service-reset-timer *time*

Command Default N/A

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1	This command is introduced on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines This command enables or disables the timer to reset the cable modem in partial service mode. It is recommended that a value of 120 or greater to be used for the timer.

Examples The following example shows how to set the timer to reset the cable modem in partial service mode:

```
Router# config terminal
Router(config)# cable lcha partial-service-reset-timer 120
```

Related Commands	Command	Description
	show cable flap-list reset-cm-list	Displays the Docsis 3.1 cable modem list that was reset by the partial service reset timer.

cable lcha sw-reset

To enable the software reset option in the normal LCHA scenario and reduce the time for linecard ISSU to complete, use the **cable lcha sw-reset enable** command in global configuration mode. To disable the software reset option, use the **cable lcha sw-reset disable** command in global configuration mode. To restore the pre-configured behavior, use the **no** form of this command.

```
cable lcha sw-reset {disable | enable}
no cable lcha sw-reset {disable | enable}
```

Command Default

N/A

Command Modes

Global configuration (config)

Command History

Release	Modification
IOS-XE 3.18.0SP	This command is introduced on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

This command enables or disables the software reset option in the normal LCHA scenario. It is only applicable to Docsis 3.1 Downstream Module with Micro firmware version 3.16 and higher.

Examples

The following example shows how to enable the software reset option:

```
Router# config terminal
Router(config)# cable lcha sw-reset enable
```

cable license 100G-conversion

The **cable license 100G-conversion** command configures the Cisco cBR to consume 100G WAN licenses for Supervisor 250G

cable license 100G-conversion

Syntax Description This command has no arguments or keywords.

Command Default Disabled

Command Modes Privileged EXEC (#)

Release	Modification
IOS-XE 16.8.1	This command was introduced.

Command	Description
cable license 100G-conversion	Configures the 10G WAN license on the 100G WAN ports.
nocable license 100G-conversion	Disables the 10G WAN license for the 100G WAN ports.

cable linecard auto-rommon-downgrade

To enable the automatic ROM-Monitor (ROMMON) image downgrade on cable interface line cards, use the **cable linecard auto-rommon-downgrade** command in global configuration mode. To disable automatic ROMMON image downgrade on cable interface line cards, use the **no** form of this command.

cable linecard auto-rommon-downgrade
no cable linecard auto-rommon-downgrade

Syntax Description

This command has no arguments or keywords.

Command Default

The automatic ROMMON image downgrade is disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCF	This command was introduced.
IOS-XE 3.15.0S	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The automatic ROMMON downgrade is disabled by default on all line cards, and we recommend that you do not change this default behavior.

Examples

The following example shows how to enable automatic ROMMON downgrade on all cable interface line cards:

```
Router(config)
# cable linecard auto-rommon-downgrade
```

The following example shows how to disable automatic ROMMON downgrade on all cable interface line cards:

```
Router(config)
# no cable linecard auto-rommon-downgrade
```

Related Commands

Command	Description
cable linecard auto-rommon-upgrade	Enables or disables automatic ROMMON image upgrade on cable interface line cards.

cable linecard auto-rommon-upgrade

To enable the automatic ROM-Monitor (ROMMON) image upgrade on cable interface line cards, use the **cable linecard auto-rommon-upgrade** command in global configuration mode. To disable automatic ROMMON upgrade on cable interface line cards, use the **no** form of this command.

cable linecard auto-rommon-upgrade
no cable linecard auto-rommon-upgrade

Syntax Description This command has no arguments or keywords.

Command Default The automatic ROMMON image upgrade is disabled.



Note Effective with Cisco IOS Release 12.2(33)SCF1, the automatic ROMMON image upgrade is enabled by default.

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(33)SCF	This command was introduced.
	IOS-XE 3.15.0S	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines To perform automatic ROMMON upgrade on the cable interface line card, use the **cable linecard auto-rommon-upgrade** command to enable automatic ROMMON image upgrade on the line card and then reload the line card.

Examples The following example shows how to enable automatic ROMMON image upgrade on all cable interface line cards:

```
Router(config)
)# cable linecard auto-rommon-upgrade
```

The following example shows how to disable automatic ROMMON image upgrade on all cable interface line cards:

```
Router(config)
)# no cable linecard auto-rommon-upgrade
```

Related Commands	Command	Description
	cable linecard auto-rommon-downgrade	Enables or disables automatic ROMMON image downgrade on cable interface line cards.

cable linecard critical-event-poweroff

To power off the Cisco uBR-MC3GX60V cable interface line card when a device temperature reaches critical threshold values on the CMTS chassis, use the **cable linecard critical-event-poweroff** command in the global configuration mode. To disable this feature, use the **no** form of the command.

cable linecard critical-event-poweroff
no cable linecard critical-event-poweroff

Syntax Description This command has no arguments or keywords.

Command Default Enabled

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(33)SCE	This command was introduced.
	IOS-XE 3.15.0S	This command is not supported on the Cisco cBR Series Converged Broadband Router.

Usage Guidelines The PRE powers off the Cisco uBR-MC3GX60V line card if any of the device temperatures on the line card exceeds the critical threshold value. To disable this power off feature, user should configure the **no cable linecard critical-event-poweroff** command and save the configuration.

The temperature thresholds for the devices on the Cisco uBR-MC3GX60V line card are:

```
Router#show environment subslot 6/0
-----
TEMPERATURE/POWER INFORMATION
-----
Number of Temperature Sensors : 9
Sampling frequency             : 2 minutes
-----
Sensor      | ID | Current | Minor | Major | Critical | Alarm |
            |    | Temperature |      |      | Threshold | Condition |
            |    | degC    |      |      | degC     |           |
-----
Nickel 10G  | 1  | 69      | 84   | 89   | 94      | Normal |
Inlet #1    | 2  | 47      | 64   | 69   | 74      | Normal |
CPU         | 3  | 68      | 86   | 91   | 96      | Normal |
Raven      | 4  | 46      | 64   | 69   | 74      | Normal |
Santana    | 5  | 36      | 57   | 62   | 67      | Normal |
Coldplay  | 6  | 63      | 73   | 78   | 83      | Normal |
Waxbill    | 7  | 76      | 85   | 90   | 95      | Normal |
Fauna      | 8  | 70      | 77   | 82   | 87      | Normal |
Fluorine   | 9  | 62      | 70   | 75   | 80      | Normal |
-----
Power: 146.216 watts
```

Examples

The following example allows the PRE to power off the Cisco uBR-MC3GX60V line card when the device temperature reaches critical threshold values.

```
Router# cable linecard critical-event-poweroff
```

Related Commands

Command	Description
show environment	Displays temperature, voltage, fan, and power supply information.

cable load-balance d20-ggrp-default

To configure a DOCSIS 2.0 general load balancing group (GLBG) that is created automatically for each fiber node (FN) configuration, use the **cable load-balance d20-ggrp-default** command in the global configuration mode. To disable the default values of the DOCSIS 2.0 GLBG, use the **no** form of this command.

```
cable load-balance d20-ggrp-default {disable | init-tech-list tech-list | docsis-policy 0-0xffffffff | interval
n | method {modemservice-flowsutilization} | threshold {load [minimum]pcmmpure-ds-loadugsus-across-ds}
| us-method {modemservice-flowsutilization}}
no cable load-balance d20-ggrp-default disable
```

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```
cable load-balance d20-ggrp-default {disable | init-tech-list tech-list | docsis-policy 0-4294967295 |
interval n | method {modemutilization} | threshold {load [minimum]pcmmpure-ds-loadugsus-across-ds} |
us-method {modemutilization}}
```



Note The default values that are set using the command apply to DOCSIS 2.0 GLBGs created thereafter. Parameters for existing DOCSIS 2.0 GLBGs do not change.

Syntax Description

disable	Disables the default values of the DOCSIS 2.0 GLBG that are enabled by default.
init-tech-list <i>tech-list</i>	Sets the default DOCSIS 2.0 GLBG DCC and DBC initialization techniques.
docsis-policy <i>0-0xffffffff</i>	Sets the default DOCSIS 2.0 GLBG load balancing policy.
interval <i>n</i>	Sets the default interface polling interval in seconds. The range is 1 to 1000.
method	Sets the default load balancing method. It can have one of the following values: <ul style="list-style-type: none"> • modems—Number of modems. • (For Cisco uBR10012 Router and Cisco uBR7200 Series Routers) service-flows—Number of service flows. • utilization—Interface utilization.
policy	Sets the default policy on modems selection based on the type of service flow to be balanced. <ul style="list-style-type: none"> • pcm—Enable balancing of modems with active PCMM service flows • pure-ds-load—Considers only DS utilization for load balancing • ugs—Enable balancing of modems with active UGS service flows • us-across-ds—Load balancing on US groups across DS, DS method will be ignored

threshold	Specifies the default threshold percentage of usage. Load balancing occurs after the threshold is exceeded. <ul style="list-style-type: none"> • load—Sets the default interface load threshold setting. <ul style="list-style-type: none"> • minimum—(Optional) Sets the minimum default interface load threshold setting. • pcmm—Sets the default PCMM service flow threshold. • stability—Sets the default threshold for stability detection. • ugs—Sets the default UGS service flow threshold. • n—Percentage of usage. The range is 1 to 100.
us-method	(Optional) Sets the default load balancing method to upstream. It can have one of the following values: <ul style="list-style-type: none"> • modems—Number of modems. • (For Cisco uBR10012 Router and Cisco uBR7200 Series Routers) service-flows—Number of service flows. • utilization—Interface utilization.

Command Default

no cable load-balance d20-ggrp-default disable
cable load-balance d20-ggrp-default init-tech-list 0-4
cable load-balance d20-ggrp-default docsis-policy 0

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCC	This command was introduced.
12.2(33)SCH	This command was modified. The interval, method, policy, and threshold keywords were introduced.
IOS-XE 3.15.0S	This command was integrated into Cisco IOS-XE Release 3.15.0S. Support for the Cisco cBR Series Converged Broadband Routers was added.

Usage Guidelines

The group parameters in the **cable load-balance d20-ggrp-default** command can be set as default values.

Examples

The following is a sample output of the **cable load-balance d20-ggrp-default** command.

```
Router(config)# cable load-balance d20-ggrp-default
Router(config)# cable load-balance d20-ggrp-default disable
Router(config)# cable load-balance d20-ggrp-default docsis-policy 2
Router(config)# cable load-balance d20-ggrp-default init-tech-list 1
Router(config)# cable load-balance d20-ggrp-default interval 1
Router(config)# cable load-balance d20-ggrp-default method modems
Router(config)# cable load-balance d20-ggrp-default policy ugs
Router(config)# cable load-balance d20-ggrp-default threshold load 10
Router(config)# cable load-balance d20-ggrp-default us-method
modems
```

Related Commands

Command	Description
cable load-balance d20-ggrp-default	Configures a DOCSIS 2.0 general load balancing group (GLBG) that is created automatically for each fiber node (FN) configuration.

cable load-balance d20 GLBG auto-generate

To automatically generate DOCSIS 2.0 general load balancing group (GLBG), use the **cable load-balance d20 GLBG auto-generate** command in privileged EXEC mode.

cable load-balance d20 GLBG auto-generate [FN *fnid*] [renew | update]

Syntax Description

FN <i>fnid</i>	(Optional) Specifies the fiber node ID number for which GLBG is automatically generated. The range is 1 - 256. If <i>fnid</i> is not specified, GLBG is created for all the fiber nodes.
renew	(Optional) Creates DOCSIS 2.0 GLBG for the current FN configuration after removing all DOCSIS load balancing groups with group IDs in the reserved range (0xff00 to 0xffff).
update	(Optional) Updates DOCSIS 2.0 GLBG with reserved group ID for the current FN configuration. See “Usage Guidelines” section for more information.

Command Default

Creates GLBG for all fiber nodes.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SCH	This command was introduced.
IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

For **renew** keyword, the command executes as follows:

- If the reserved group range (0xff00 to 0xffff) has not been used for any GLBG, a new GLBG is created for the current fiber node.
- If the reserved group range has been used for any GLBG, the existing GLBG is removed and a new GLBG is created for the current fiber node configuration.
- If the reserved group ID has been used for a restricted load balancing group (RLBG), the command fails with a warning message.

For **update** keyword, the command executes as follows:

- If the reserved group range (0xff00 to 0xffff) has not been used for any GLBG, a new GLBG is created for that fiber node.
- If the reserved group range has been used for any GLBG, the GLBG is updated for the current fiber node configuration.
- If the reserved group ID has been used for a restricted load balancing group (RLBG), the command fails with a warning message.

This command is associated with Auto-generate DOCSIS 2.0 GLBG feature.

Examples

The following example shows how to configure the **cable load-balance d20 GLBG auto-generate** command:

```
Router#  
Router# cable load-balance d20 GLBG auto-generate  
FN  
3  
Router#
```

Related Commands

Command	Description
show cable load-balance docsis-group	Displays real time configurational, statistical, and operational information of the load balancing operations on the router.

cable load-balance d30-ggrp-default

To configure a DOCSIS 3.0 general load balancing group (GLBG) that is created automatically for each MD-CM-SG based on the fiber node (FN) configuration, use the **cable load-balance d30-ggrp-default** command in the global configuration mode. To disable the default values of the DOCSIS 3.0 GLBG, use the **no** form of this command.

```
cable load-balance d30-ggrp-default {disable | init-tech-list tech-list | docsis-policy 0-0xffffffff | interval
n | method {modemservice-flowsutilization} | threshold {load [minimum]pcmmpure-ds-loadugsus-across-ds}
| us-method {modemservice-flowsutilization}}
no cable load-balance d30-ggrp-default disable
```

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```
cable load-balance d30-ggrp-default {disable | init-tech-list tech-list | docsis-policy 0-4294967295 |
interval n | method {modemutilization} | threshold {load [minimum]pcmmpure-ds-loadugsus-across-ds} |
us-method {modemutilization}}
```



Note The default values that are set using the command apply to DOCSIS 3.0 GLBGs created thereafter. Parameters for existing DOCSIS 3.0 GLBGs do not change.

Syntax Description

disable	Disables the default values of the DOCSIS 3.0 GLBG that are enabled by default.
init-tech-list <i>tech-list</i>	Sets the default DOCSIS 3.0 GLBG DCC and DBC initialization techniques.
docsis-policy <i>0-0xffffffff</i>	Sets the default DOCSIS 3.0 GLBG load balancing policy.
interval	Sets the default interface polling interval in seconds. The range is 1-1000.
method	Sets default load balancing method. It can have one of the following values: <ul style="list-style-type: none"> • modems—Number of modems. • (For Cisco uBR10012 Router and Cisco uBR7200 Series Routers) service-flows—Number of service flows. • utilization—Interface utilization.
policy	Sets the default policy for modems selection based on the type of service flow to be balanced. <ul style="list-style-type: none"> • pcm—Enable balancing of modems with active PCMM service flows • pure-ds-load—Considers only DS utilization for load balancing • ugs—Enable balancing of modems with active UGS service flows • us-across-ds—Load balancing on US groups across DS groups

threshold	Specifies the default threshold percentage of usage. Load balancing occurs after the threshold is exceeded. <ul style="list-style-type: none"> • load—Sets the default interface load threshold setting. • minimum—(Optional) Sets the minimum default interface load threshold setting. • pcmm—Sets the default PCMM service flow threshold. • stability—Sets the default threshold for stability detection. • ugs—Sets the default UGS service flow threshold. • n—Percentage of usage. The range is 1 to 100.
us-method	(Optional) Sets the default load balancing method to upstream. It can have one of the following values: <ul style="list-style-type: none"> • modems—Number of modems. • (For Cisco uBR10012 Router and Cisco uBR7200 Series Routers) service-flows—Number of service flows. • utilization—Interface utilization.

Command Default

no cable load-balance d30-ggrp-default disable

cable load-balance d30-ggrp-default init-tech-list 0-4

cable load-balance d30-ggrp-default docsis-policy 0

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCC	This command was introduced.
12.2(33)SCH	This command was modified. The interval, method, policy, and threshold keywords were introduced.
IOS-XE 3.15.0S	This command was integrated into Cisco IOS-XE Release 3.15.0S. Support for the Cisco cBR Series Converged Broadband Routers was added.

Usage Guidelines

The group parameters in the **cable load-balance d30-ggrp-default** command can be set as default values.

Examples

The following is a sample output of the **cable load-balance d30-ggrp-default** command.

```
Router(config)# cable load-balance d30-ggrp-default
Router(config)# cable load-balance d30-ggrp-default disable
Router(config)# cable load-balance d30-ggrp-default docsis-policy 2
Router(config)# cable load-balance d30-ggrp-default init-tech-list 1
Router(config)# cable load-balance d20-ggrp-default interval 1
Router(config)# cable load-balance d20-ggrp-default method modems
Router(config)# cable load-balance d20-ggrp-default policy ugs
Router(config)# cable load-balance d20-ggrp-default threshold load 10
Router(config)# cable load-balance d20-ggrp-default us-method
modems
```

Related Commands

Command	Description
cable load-balance d20-ggrp-default	Configure a DOCSIS 2.0 general load balancing group (GLBG) that is created automatically for each fiber node (FN) configuration

cable load-balance docsis-enable

To enable or disable DOCSIS load balancing on the CMTS, use the **cable load-balance docsis-enable** command in the global configuration mode. To disable DOCSIS load balancing, use the **no** form of this command.

cable load-balance docsis-enable
no cable load-balance docsis-enable

Syntax Description This command has no arguments or keywords.

Command Default The command is disabled on all the routers.

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(33)SCC	This command was introduced.
	IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.
	IOS-XE 3.17.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines When the **no cable load-balance docsis-enable** command is configured, cable modems do not participate in the load balancing operation after they are assigned to the correct Load Balancing Group (LBG).

However, the **no cable load-balance docsis-enable** command does not prevent the cable modems from moving to the correct LBG, therefore, the **show cable load-balance docsis-group pending** and **show cable load-balance** commands may display the movement of the cable modems while they are being assigned to the correct LBG. This is an expected behavior.

Examples

The following example shows how to enable DOCSIS load balancing on the CMTS using the **cable load-balance docsis-enable** command.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance docsis-enable
Config: Last Batch 0, 38 bytes
cable load-balance docsis-enable
end
Router(config)#
```

Related Commands	Command	Description
	cable load-balance docsis-group	Configures a DOCSIS load balancing group on the CMTS.
	show cable load-balance docsis-group	Displays real-time configuration, statistical and operational information for load balancing operations on the router.

cable load-balance docsis20-enable

To enable dynamic downstream Load Balancing for DOCSIS 2.0 Cable Modems, use the **cable load-balance docsis20-enable** command in global configuration mode. Use the **no** form of this command to disable this feature.

cable load-balance docsis20-enable
no cable load-balance docsis20-enable

Syntax Description This command has no arguments or keywords.

Command Default This command is enabled by default.

Command Modes Global configuration mode (config)

Release	Modification
IOS-XE 3.17.0S	This command was introduced on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines Please provide some usage guidelines.

When the **no cable load-balance docsis20-enable** command is configured, cable modems which are narrow-band online does not participate in the load balancing operation after the correct Load Balancing Group (LBG) is assigned.

The following example show how to configure the enable dynamic downstream Load Balancing for DOCSIS 2.0 Cable Modems using the **no cable load-balance docsis20-enable** command:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# no cable load-balance docsis20-enable
Router(config)# end
```

Related Commands

Command	Description
show cable load-balance	Displays real-time configurational, statistical and operational information for load balancing operations on the router.
show cable load-balance docsis-group	Displays real-time configurational, statistical, and operational information of the DOCSIS group operations on the router.

cable load-balance docsis30-enable

To enable DOCSIS 3.0 static modem count-based load balancing, use the **cable load-balance docsis30-enable** command in global configuration mode. To disable DOCSIS 3.0 static modem count-based load balancing, use the **no** form of this command.

```
cable load-balance docsis30-enable [downstream-only]
no cable load-balance docsis30-enable [downstream-only]
```

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```
cable load-balance docsis30-enable
no cable load-balance docsis30-enable
```

Syntax Description	downstream-only (For Cisco uBR10012 Router and Cisco uBR7200 Series Routers) Enables only downstream load balancing without enabling upstream load balancing.
---------------------------	--

Command Default By default, DOCSIS 3.0 static modem count-based load balancing is enabled.

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(33)SCF1	This command was introduced.
	12.2(33)SCH1	This command was modified. The downstream-only keyword was added.
	12.2(33)SCG6	This command was integrated into Cisco IOS Release 12.2(33)SCG6.
	IOS-XE 3.15.0S	This command was integrated into Cisco IOS-XE Release 3.15.0S. Support for the Cisco cBR Series Converged Broadband Routers was added.
	IOS-XE 3.17.0S	This command is implemented on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines Use the **downstream-only** keyword to enable only the downstream load balancing. When the **downstream-only** keyword is used, upstream load balancing is disabled.

Examples

The following example shows how to disable DOCSIS 3.0 static modem count-based load balancing:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# no cable load-balance docsis30-enable
Router(config)#
```

The following example shows how enable only downstream load balancing, without enabling upstream load balancing:

```
Router# configure terminal
```

Enter configuration commands, one per line. End with CNTL/Z.
 Router(config)# **cable load-balance docsis30-enable downstream-only**

Router(config)#

The following example shows how to verify if the DOCSIS 3.0 static modem count-based load balancing is disabled:

```
Router# show cable load-balance | include DOCSIS 3
DOCSIS 2.0 LB Enabled: Yes DOCSIS 3.0 LB Enabled: No
DOCSIS 3.0 General LB
```

The following example shows how to enable DOCSIS 3.0 static modem count-based load balancing:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance docsis30-enable
Router(config)#
```

The following example shows how to verify if DOCSIS 3.0 static modem count-based load balancing is enabled:

```
Router# show cable load-balance | include DOCSIS 3
DOCSIS 2.0 LB Enabled: Yes DOCSIS 3.0 LB Enabled: Yes
DOCSIS 3.0 General LB
```

Effective with Cisco IOS Release 12.2(33)SCH1, the output of the **show cable load-balance** command shows the status of the **downstream-only** keyword configuration. The following example shows how to verify if only downstream load balancing is enabled:

```
Router#show cable load-balance
Load for five secs: 0%/0%; one minute: 0%; five minutes: 0%
Time source is NTP, 20:22:33.307 UTC Wed Jul 17 2013
Legacy Group Interval Method DCC Init Threshold
Group Index Technique Minimum Static Enforce Ugs
PCMM
1 513 30 modems 0 5 10% --- ---
---
DOCSIS 2.0 LB Enabled: Yes DOCSIS 3.0 LB Downstream Enabled: Yes DOCSIS 3.0 LB U
pstream Enabled: No
DOCSIS Group Status Interval DCC mask Policy Method Threshold
Group Index /UCC DS/US M/E/U/P/S
1 1 GE 30 0xF8(0)/N 5 m/m 5/10/70/70/50
2 2 RE 30 0x40(1)/N 1 m/m 2/2/70/70/50
DOCSIS 3.0 General LB
MD FN Group S Intv DCC mask Policy Mtd MD-CM-SG Threshold
Index /UCC D/U M/E/U/P/S
Ca5/0/0 1 32768 E 30 0xF8(0)/N 0 m/m 0x101 5/10/70/70/50
Router#
```

The **cable load-balance docsis30-enable** command is used to configure the following features:

- [Load Balancing, Dynamic Channel Change, and Dynamic Bonding Change on the Cisco CMTS Routers](#)
- [Restricted/General Load Balancing and Narrowband Dynamic Bandwidth Sharing with Downstream Dynamic Load Balancing](#)

Related Commands

Command	Description
show cable load-balance	Displays real-time configurational, statistical and operational information for load balancing operations on the router.
show cable load-balance docsis-group	Displays real-time configurational, statistical, and operational information of the DOCSIS group operations on the router.

cable load-balance docsis30-enable dynamic downstream

To enable utilization based dynamic downstream Load Balancing for DOCSIS 3.0 Cable Modems, use the **cable load-balance docsis30-enable dynamic downstream** command in global configuration mode. Use the **no** form of this command to disable this feature.

cable load-balance docsis30-enable dynamic downstream
no cable load-balance docsis30-enable dynamic downstream

This command has no arguments or keywords.

Command Default

The command is disabled by default.

Command Modes

Global configuration mode (config)

Release	Modification
IOS-XE 3.17.0S	This command was introduced on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

When the **cable load-balance docsis30-enable dynamic downstream** command is configured, cable modems which are wide-band online participates in the dynamic downstream utilization based on load balancing operation after the correct Load Balancing Group (LBG) is assigned.

The following example shows how to enable utilization based dynamic downstream Load Balancing for DOCSIS 3.0 Cable Modems using the **cable load-balance docsis30-enable dynamic downstream** command:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance docsis30-enable dynamic downstream
endRouter(config)#
```

Related Commands

Command	Description
show cable load-balance	Displays real-time configurational, statistical and operational information for load balancing operations on the router.
show cable load-balance docsis-group	Displays real-time configurational, statistical, and operational information of the DOCSIS group operations on the router.

cable load-balance docsis30-enable static

To enable static downstream Load Balancing for DOCSIS 3.0 Cable Modems, use the **cable load-balance docsis30-enable static** command in global configuration mode. Use the **no** form of this command to disable this feature.

cable load-balance docsis30-enable static
no cable load-balance docsis30-enable static

Syntax Description **static** Please provide a description.

Command Default The command is enabled by default.

Command Modes Global configuration mode (config)

Release	Modification
IOS-XE 3.17.0S	This command was introduced on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines When the **cable load-balance docsis30-enable static** command is configured, cable modems which are wide-band online does not participate in the static modem count based load balancing operation after the correct Load Balancing Group (LBG) is assigned.

The following example shows how to enable static downstream Load Balancing for DOCSIS 3.0 Cable Modems using the **cable load-balance docsis30-enable static** command:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# no cable load-balance docsis30-enable static
Router(config)# end
```

Related Commands	Command	Description
	show cable load-balance	Displays real-time configurational, statistical and operational information for load balancing operations on the router.
	show cable load-balance docsis-group	Displays real-time configurational, statistical, and operational information of the DOCSIS group operations on the router.

cable load-balance docsis30-dynamic-enable

To enable DOCSIS 3.0 dynamic load balancing on the downstream channels, use the **cable load-balance docsis30-dynamic-enable** command in the global configuration mode. To disable the DOCSIS 3.0 dynamic load balancing, use the **no** form of this command.

cable load-balance docsis30-dynamic-enable

no cable load-balance docsis30-dynamic-enable

Syntax Description This command has no arguments or keywords.

Command Default The DOCSIS 3.0 dynamic load balancing is disabled.

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(33)SCI	This command was introduced.
	IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines Before configuring the DOCSIS 3.0 dynamic load balancing on Cisco CMTS, you need to enable DOCSIS 2.0 and DOCSIS 3.0 load balancing on CMTS.

Example

The following example shows how to enable the DOCSIS 3.0 dynamic load balancing on the CMTS using the **cable load-balance docsis30-dynamic-enable** command.

```
Router>enable
Router# configure terminal
Router(config)# cable load-balance docsis30-dynamic-enable
Router(config)# exit
```

Related Commands

Command	Description
show cable load-balance	Displays real-time configuration, statistical and operational information for load balancing operations on the router.
clear cable load-balance error-statistics	Clears all the failure counters in error statistics.
show cable load-balance	Displays information of the DOCSIS 3.0 and DOCSIS 2.0 load balance failure.
show cable load-balance docsis-group	Displays real-time configurational, statistical, and operational information of the DOCSIS group operations on the router.

cable load-balance docsis-group

To configure a DOCSIS load balancing group (LBG) on the CMTS, use the **cable load-balance docsis-group** command in the global configuration mode. To delete a DOCSIS load balancing group and to remove it from the CMTS configuration, use the **no** form of this command.

```
cable load-balance docsis-group docsis-group-id
no cable load-balance docsis-group docsis-group-id
```

Cisco uBR10012 Router

```
cable load-balance docsis-groupFN fn-id MD cable slot/subslot/port
```

Cisco uBR7225VXR and Cisco uBR7246VXR Routers

```
cable load-balance docsis-groupFN fn-id MD cable slot/port
```

Cisco cBR Series Converged Broadband Routers

```
cable load-balance docsis-groupFN fn-id MD cable slot/subslot/port
```

Syntax Description	
<i>docsis-group-id</i>	DOCSIS load balance group ID. A valid DOCSIS load balance group ID ranges from 1 to 2147483647 and does not overlap with the legacy LBG ID. Therefore, both cable load-balance group 1 and cable load-balance docsis-group 1 commands can be configured. The DOCSIS load balance group ID ranging from 2147483648 to $2^{32}-1$ is reserved for DOCSIS 3.0 general load balancing group (GLBG).
FN <i>fn-id</i>	Specifies the fiber node (FN) where certain DOCSIS 3.0 GLBG parameters, such as disable , docsis-policy , init-tech-list , interval , method , policy , and threshold , can be configured.
MD <i>cable slot/subslot/port</i>	Specifies the MAC domain interface of the fiber node. <ul style="list-style-type: none"> <i>slot</i>—Slot where the line card resides. The permitted range is from 5 to 8. The permitted range is 0 to 9 in cBR. <i>subslot</i>—Subslot where the line card resides. The available slots are 0 or 1. For cBR, only slot 0 is available. <i>port</i>—The downstream controller number on the line card. The permitted <i>port</i> range is from 0 to 4. For cBR, the permitted range is 0 to 15.
MD <i>cable slot/port</i>	Specifies the MAC domain interface of the fiber node on the Cisco uBR7246VXR or Cisco uBR7225VXR router. <ul style="list-style-type: none"> <i>slot</i>—Slot where the line card resides. <ul style="list-style-type: none"> Cisco uBR7225VXR router—The valid range is from 1 to 2. Cisco uBR7246VXR router—The valid range is from 3 to 6. <i>port</i>—Downstream controller number on the line card. The permitted <i>port</i> values are 0 or 1.

Command Default None

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCC	This command was introduced.
IOS-XE 3.15.0S	This command was integrated into Cisco IOS-XE Release 3.15.0S. Support for the Cisco cBR Series Converged Broadband Routers was added.

Usage Guidelines

The **cable load-balance docsis-group** command creates a DOCSIS LBG with the specified number and then enters the config-lb-group configuration mode. Use the config-lb-group configuration mode to configure the DOCSIS LBG.

- **disable**
- **docsis-policy**
- **downstream**
- **init-tech-list**
- **init-tech-ovr**
- **interval**
- **method**
- **policy**
- **restricted**
- **service-type-id**
- **tag**
- **threshold**
- **upstream**

Examples

The following example shows how to create a DOCSIS group numbered "1":

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance docsis-group 1
Router(config-lb-group)# init-tech-list 1 ucc
Router(config-lb-group)# downstream Cable 1/1
Router(config-lb-group)# upstream Cable 1/0 2
Router(config-lb-group)# docsis-policy 0
Router(config-lb-group)# init-tech-ovr Cable 1/1 1 Cable 1/0 2 init-tech-list 1 ucc
Router(config-lb-group)# service-type-id ccc
Router(config-lb-group)# tag t1
Router(config-lb-group)# interval 10
Router(config-lb-group)# method modems us-method modems
Router(config-lb-group)# no policy us-across-ds pure-ds-load ugs

Router(config-lb-group)# restricted
Router(config-lb-group)# threshold pcmm 70 load 10 stability 50 ugs 70
Router(config-lb-group)#
```

The following example shows how to configure DOCSIS 3.0 GLBG parameters:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance docsis-group FN 2 MD cable 1/0
```

Related Commands	Command	Description
	docsis-policy	Assigns a policy to a group, which is the default policy assigned to the CM when the CM is not assigned a different policy.
	downstream	Sets downstream RF channels.
	upstream	Sets upstream channels.
	init-tech-list	Sets the DCC/DBC initialization techniques that the CMTS uses to load balance cable modems. The init-tech-list command can also be used to determine whether UCC can be used for modems during dynamic upstream load balancing.
	init-tech-ovr	<p>(For Cisco uBR10012, uBR7225VXR and uBR7246VXR Series Routers) Sets DCC initialization techniques that overrides the physical upstream channel pair. The init-tech-ovr command can also be used to determine whether UCC can be used for modems during dynamic upstream load balancing.</p> <p>Note The init-tech-list command accepts an upstream that is not added into the load balancing group. The upstream channel pair is invalid until the upstream is added. When the load balancing group is removed, all upstream channel pairs are also removed.</p>
	interval	Sets the duration of time the CMTS waits before checking the load on an interface.
	method	Selects the method the CMTS uses to determine the load. US methods can be different from DS methods.
	policy	Selects modems, based on the type of service flow that will be balanced.
	restricted	Selects the restricted group type. By default, the general group type is selected.
	service-type-id	Adds a service type ID that is compared with the cable modem provisioned service type ID, to determine an appropriate restricted load balancing group (RLBG).
	tag	Adds a tag to the load balancing group. The tag is used to assign the RLBG to the CMs that have the same tag name.
	threshold	Specifies the threshold percentage of use exceeding which load balancing occurs.
	cable tag	Configures the tag that gets added to the load balancing group.

cable load-balance docsis-policy

To create a DOCSIS policy and associate an existing rule and tag with the policy, use the **cable load-balance docsis-policy** command in global configuration mode. To remove a DOCSIS policy, rule, or tag from the policy, use the **no** form of this command.

cable load-balance docsis-policy *policy-id* [**rule** *rule-id* | **tag** *tag name* [**override**]]
no cable load-balance docsis-policy *policy-id* [**rule** *rule-id* | **tag** *tag name* [**override**]]

Syntax Description

<i>policy-id</i>	Specifies the DOCSIS policy to be created.
rule <i>rule-id</i>	Specifies the rule to be used with the DOCSIS policy.
tag <i>tag name</i>	Specifies the tag to be used with the DOCSIS policy.
override	Overrides all the policies in the CM that has the specified tag name.

Command Default

None

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCB	This command was introduced.
12.2(33)SCC	The tag parameter was added to the command.
IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

This command associates a rule with a policy. A policy is created only when a rule is associated with it. Similarly, the policy is removed if you remove the last rule associated with the policy.

Examples

The following example defines a DOCSIS policy, and associates a predefined rule and tag with this policy:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance docsis-policy 1 rule 1
Router(config)# cable load-balance docsis-policy 1 tag SPG override
Router(config)#
```

Related Commands

Command	Description
cable load-balance rule	Creates a rule to prevent CM from disabling or enabling load balancing.
cable tag	Creates a tag to associate it with DOCSIS policies and groups.

cable load-balance exclude

To exclude a particular cable modem, or all cable modems from a particular vendor, from one or more forms of load-balancing operations, use the **cable load-balance exclude** command in global configuration mode. To end the exclusion, so that these particular cable modems are subject to the load-balancing policies of the load-balance group to which they belong, use the **no** form of this command.

```
cable load-balance exclude {device-class id | modem mac-address | oui word} [mask | assignment | enforce | static | strict]
```

```
cable load-balance exclude {device-class id | modem mac-address | oui word}
```

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```
cable load-balance exclude { modem mac-address | oui word }
```

Syntax Description

device-class <i>id</i>	(For Cisco uBR10012 Router and Cisco uBR7200 Series Routers) Specifies the device class ID of the cable modems to be excluded in a bitmap format (0-ffff).
modem <i>mac-address</i>	Specifies the hardware (MAC) address of an individual cable modem to be excluded from load balancing. (You cannot specify a multicast MAC address.)
<i>mask</i>	(Optional) Specifies the mask for the range (group) of hardware (MAC) addresses, so that the cable modems with hardware (MAC) addresses in that range are excluded from load balancing.
oui <i>word</i>	Specifies the organization unique identifier (OUI) of a vendor, so that cable modems from this vendor are excluded from load balancing. The OUI must be specified as three hexadecimal bytes separated by either periods or colons.
assignment	(Optional) Excludes the cable modems that were moved into a load balancing group in assignment phase.
enforce	(Optional) Excludes the cable modems from dynamic load balancing, but they continue to participate in static load balancing.
static	(Optional) Excludes the cable modems from static load balancing, but they continue to participate in passive load balancing and dynamic load balancing.
strict	(Optional) Excludes the cable modems from all forms of load balancing.



Note Passive load balancing is not supported on cBR Series Converged Broadband Routers.

Command Default

By default, all cable modems on an interface are automatically included in all configured load-balancing operations when that cable interface is assigned to a load-balance group (**no cable load-balance exclude**). When a cable modem is excluded without any options specified, the cable modem is excluded from dynamic and static load balancing, but it continues to participate in passive load balancing.

Command Modes

Global configuration

Command History	Release	Modification
	12.2(15)BC1	This command was introduced for the Cisco uBR7246VXR and Cisco uBR10012 routers.
	12.2(33)SCH	This command was modified with the following argument and keywords: <ul style="list-style-type: none"> • <i>mask</i> • assignment • device-class
	IOS-XE 3.15.0S	This command was integrated into Cisco IOS-XE Release 3.15.0S. Support for the Cisco cBR Series Converged Broadband Routers was added.

Usage Guidelines

The **cable load-balance exclude** command allows you to specify that particular cable modems should not participate in one or more types of load-balancing operations. This might be done for cable modems that are currently provisioned for premium services, for cable modems that do not respond appropriately to upstream channel change (UCC) or channel override messages, or for other reasons.

In particular, you must use the **cable load-balance exclude** command to exclude cable modems that require specific upstream channels or downstream frequencies. Load balancing cannot be done when cable modems are assigned specific channels or frequencies in their DOCSIS configuration files.

The load balancing process has two phases.

- Assignment phase:

When a modem is coming online in the assignment phase, the modem is moved to the load balance group by assigning it a load balancing group (LBG) ID. The assignment phase occurs only when a modem is coming online. Use the **assignment** option to exclude a modem during the assignment phase.

- Balancing phase:

In the balancing phase, a modem is re-assigned to an LBG to balance the load. Use the **static** option to exclude a modem from static load balancing, the **enforce**, or **strict** options from dynamic load balancing, in the balancing phase.

You can use the **cable load-balance exclude** command to specify that these cable modems should not participate in the following types of load-balancing operations:

- Static load balancing—Load balancing is done at the time a cable modem registers by specifying the proper target channel in the Downstream Frequency Override or an Upstream Channel ID Override field in the registration response (REG-RSP) message that the Cisco CMTS sends to the cable modem. This is the default form of registration-based load balancing.
- Passive load balancing—Load balancing is done at the time a cable modem registers by ignoring a cable modem's registration request (REG-REQ) message until it uses the correct target channels. Use the **cable load-balance exclude** command to specify this form of load balancing for older cable modems that do not respond well to the active form of load balancing.



Note Passive load balancing is not supported on cBR Series Converged Broadband Routers.

- Dynamic load balancing—A form of traffic-based load balancing, in which cable modems are balanced among upstreams and downstreams after they come online, while they are passing traffic. (Dynamic load balancing is enabled using the **enforce** option with the **cable load-balance group threshold** command.)

Use the **cable load-balance exclude** command to exclude a cable modem from any combination of load-balancing operations. The table below shows which forms of load-balancing operations are excluded and which are enabled for each form of the **cable load-balance exclude** command:

Table 1: cable load-balance exclude Command

	Static	Passive ¹	Dynamic ²
Default (no cable load-balance exclude)	Yes	Excluded	Yes
cable load-balance exclude	Excluded	Yes	Excluded
cable load-balance exclude enforce	Yes	Excluded	Excluded
cable load-balance exclude static	Excluded	Yes	Yes
cable load-balance exclude strict	Excluded	Excluded	Excluded
cable load-balance exclude static strict	Excluded	Excluded	Yes

¹ Passive load balancing is not supported on cBR Series Converged Broadband Routers.

² Dynamic load balancing must also be separately enabled for a load-balance group by using the **enforce** option with the **cable load-balance group threshold** command.



Note Excluding cable modems might be required for some cable modems that are not DOCSIS-compliant. Such cable modems can go offline for long periods of time when load balancing is attempted using DOCSIS MAC messages. If this is the case, use the **cable load-balance exclude** command to exclude such cable modems from load-balancing operations until the modem can be upgraded to DOCSIS-compliant software.

Effective with Cisco IOS Release 12.2(33)SCH, you can configure the **cable load-balance exclude** command once to exclude all the STBs, that do not support load balancing, using the mask argument. You can also move cable modems that were moved to a load balancing group in assignment phase, using the assignment option.

Examples

The following example shows how to exclude a particular cable modem with the MAC address of 0001.0203.0405 from active and dynamic load-balancing operations:

```
Router# config terminal
Router(config)# cable load-balance exclude mac 0001.0203.0405
```

The following example shows how to exclude all cable modems with the OUI of 00.00.0C from active and dynamic load-balancing operations:

```
Router# config terminal
Router(config)# cable load-balance exclude oui 00.00.0C
```

The following example shows how to exclude all cable modems with the OUI of 00.00.0C from dynamic load-balancing operations. These cable modems are still subject to static load-balancing operations.

```
Router# config terminal
Router(config)# cable load-balance exclude oui 00.00.0C enforce
```

The following example shows how to exclude a particular cable modem from all forms of load-balancing operations:

```
Router# config terminal
Router(config)# cable load-balance exclude mac 0001.0203.0405
strict
```

The following example shows how to exclude all the cable modems with MAC address 0016.924f.82b4 and mask f000.0000.0000 which have been moved to the load balancing group in the assignment phase.

```
Router# configure terminal
Router(config)# cable load-balance exclude modem 0016.924f.82b4 f000.0000.0000 assignment
```

The following example shows how to exclude cable modems from DOCSIS load balance based on the cable modem device class:

```
Router# config terminal
Router(config)# cable load-balance exclude device-class 1
```

The **cable load-balance exclude** command is associated with the [Excluding Cable Modems from a Load Balancing Group](#) feature.

Related Commands

Command	Description
cable load-balance group (global configuration)	Creates and configures a load-balance group.
cable load-balance group (interface configuration)	Assigns a downstream to a load-balance group.
cable load-balance group interval	Configures the frequency of the load-balancing policy updates.
cable load-balance group policy ugs	Configures how the Cisco CMTS should load balance cable modems with active unsolicited grant service (UGS) service flows.
cable load-balance group threshold	Configures the threshold values that a load-balance group should use for load-balancing operations.
cable upstream load-balance group	Assigns an upstream to a load-balance group.
clear cable load-balance	Clears the counters or state machine used to track load-balancing operations.
show cable load-balance	Displays real-time statistical and operational information for load-balancing operations.

cable load-balance fixed-primary-channel

To reduce service outage while enabling dynamic load balancing, enable fixed primary channel movement, use the **cable load-balance fixed-primary-channel** command in global configuration mode.

DOCSIS 3.0 load balance does not change the modem's primary channel during dynamic movement when you enable fixed primary channel movement.

cable load-balance fixed-primary-channel

Command Default

Fixed primary channel for load balancing is not enabled by default on the Cisco CMTS.

Command Modes

Global configuration

Command History

Release	Modification
IOS-XE 16.7.1	This command was introduced on the Cisco cBR Series Converged Broadband Routers.

Examples

The following example shows how to enable fixed primary channel movement:

```
Router# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance fixed-primary-channel
Router(config)# end
```

The following example shows how to check the enabled status of the fixed primary channel movement:

```
Router# show run
Router# show running-config | in fixed
cable load-balance fixed-primary-channel
```

Related Commands

Command	Description
cable load-balance docsis30-enable dynamic downstream	Enables utilization based dynamic downstream Load Balancing for DOCSIS Cable Modems

cable load-balance group

To create a load-balance group and configure the type of load-balancing to be used, use the **cable load-balance group** command in global configuration mode. To delete a load-balance group, use the **no** form of this command. To reset a load-balance group to its default configuration, use the **default** form of this command.

cable load-balance group *n* [**method utilization** | **method modem** | **method service-flows**]
no cable load-balance group *n*

Syntax Description	
<i>n</i>	Specifies the number of the load balance group. In Cisco IOS Release 12.2(33)SCE3 and earlier, the valid range is from 1 to 80. In Cisco IOS Release 12.2(33)SCE4 and later, the valid range is from 1 to 256.
method modem	(Optional) Specifies that the load-balance group should use the number of active cable modems on an interface to determine the current load (default). This method does not take into account the amount of traffic flowing through those particular cable modems.
method service-flows	(Optional) Specifies that the load-balance group should use the number of active service flow IDs (SFIDs) on an interface to determine the current load.
method utilization	(Optional) Specifies that the load-balance group should use an interface's current percentage of utilization to determine the current load. Tip The utilization method does not begin moving cable modems for load balancing until the utilization of the interface is at 25 percent or more. This is done to avoid the unnecessary moving of cable modems due to temporary spikes in an interface's utilization rates.

Command Default No load-balance groups are created. By default, a load-balance group uses the actual number of cable modems online each interface to determine load balancing needs (**modem** option).



Note If you do not create any load-balance groups, the Cisco CMTS defaults to using a form of registration-based load balancing that attempts to equally distribute cable modems among upstreams at the time the cable modems register and come online. No load balancing is done for downstreams or for cable modems that are already online.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(15)BC1	This command was introduced for the Cisco uBR7246VXR and Cisco uBR10012 routers.
12.2(33)SCE4	The valid range for the load balance group was changed.

Release	Modification
IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The **cable load-balance group** command is used to configure the following features:

- [IGMP-Triggered Dynamic Channel Change Load Balancing for DOCSIS 2.0 Cable Modems](#)
- [Load Balancing and Dynamic Channel Change on the Cisco CMTS Routers](#)
- [Restricted/General Load Balancing and Narrowband Dynamic Bandwidth Sharing with Downstream Dynamic Load Balancing](#)

The **cable load-balance** command creates a load-balance group, which can then be assigned to a number of upstream and downstream cable interfaces to allow the Cisco CMTS to load balance cable modems as needed. The Cisco CMTS can use the load-balance groups for static, passive, and dynamic load balancing of both upstream and downstream channels. You can configure downstreams and upstreams to use the same load balancing parameters, or you can configure upstreams and downstreams separately.



Note You can create a maximum of 20 load-balance groups on each chassis. However, you can reuse those load-balance groups on different sets of cable interfaces, as long as they are in different domains. If downstreams are not included in a load-balance group, then each downstream can be considered a separate domain.

Use the **cable load-balance group (global configuration)** command to initially create and configure a load-balance group. Then use the **cable load-balance group (interface configuration)** command to assign this load-balance group to an upstream or downstream, so that the cable interface will begin participating in load-balancing operations.

You can configure a load-balance group to use one of the following types of load-balancing methods:

- **Modem Method**—Uses the number of active cable modems on an interface.
- **Service Flow Method**—Uses the number of active Service Flow IDs (SFIDs) on an interface.
- **Utilization Method**—Uses an interface's current percentage of utilization.

See the following sections for more information about each method.

Modem Method

The **modem** method of load-balancing uses the number of active cable modems on an interface to determine the current load. This is a form of distribution-based load balancing, in which the absolute numbers of modems are used to determine whether interfaces are load balanced.

This method does not take into account the amount of traffic flowing through the cable modems, but the system does take into account the relative bandwidth of the channels being used, so that channels with higher bandwidths are allocated higher numbers of cable modems. This means that when interfaces are using different channel widths or modulation profiles, the system can assign different numbers of cable modems to the interfaces to achieve a balanced load. For example:

- **Channel widths**— If two upstreams are being load balanced, and one upstream is configured with a channel width of 1.6 MHz and the other upstream is configured for a channel width of 3.2 MHz, the Cisco CMTS allocates twice as many cable modems to the second upstream, because its channel width is twice as large as the first upstream's channel width.

- Modulation profiles— If one downstream is configured for 64-QAM and the other downstream is configured for 256-QAM, the Cisco CMTS allocates a proportionately larger number of cable modems to the second downstream so as to achieve a balanced load.

When both the channel width and different modulation profile are set differently on two interfaces, the system calculates a “weight” value to use as a guide to determine the relative bandwidths of the interfaces.



Tip In a system with balanced loads, the interfaces will contain the same number of cable modems only when the interfaces are configured with the same modulation parameters.

Service Flow Method

The **service-flows** method of load balancing uses the number of active service flow IDs (SFIDs) on an interface to determine the current load. This is a form of distribution-based load balancing, in which the absolute numbers of service flows are used to determine whether interfaces are load balanced.

This method does not take into account the amount of traffic flowing on each SFID, but the system does take into account the relative bandwidth of the channels being used, so that channels with higher bandwidths are allocated higher numbers of SFIDs. This means that when interfaces are using different channel widths or modulation profiles, the system can assign different numbers of SFIDs to the interfaces to achieve a balanced load. For example:

- Channel widths— For example, if two upstreams are being load balanced, and one upstream is configured with a channel width of 1.6 MHz and the other upstream is configured for a channel width of 3.2 MHz, the Cisco CMTS allocates twice as many SFIDs to the second upstream, because its channel width is twice as large as the first upstream’s channel width.
- Modulation profiles— For example, if one downstream is configured for 64-QAM and the other downstream is configured for 256-QAM, the Cisco CMTS allocates a proportionately larger number of SFIDs to the second downstream so as to achieve a balanced load.

When both the channel width and different modulation profile are set differently on two interfaces, the system calculates a “weight” value to use as a guide to determine the relative bandwidths of the interfaces.



Tip In a system with balanced loads, the interfaces will contain the same number of SFIDs only when the interfaces are configured with the same modulation parameters.

Utilization Method

The **utilization** method uses an interface’s current percentage of utilization to determine the current load. This method uses the amount of traffic being sent over an interface, in the form of the percentage of total bandwidth being used. (To avoid unnecessary movement of cable modems, the **utilization** method does not perform load balancing until an interface is at least 25 percent of utilization.)



Note Do not use the **utilization** method of load balancing on cable interfaces that have a small number of cable modems and where a single modem is responsible for the majority of the interface load. In this condition, the Cisco CMTS could end up continually moving cable modems from one interface to another in an endless attempt to load balance the interfaces. To avoid this, configure the utilization threshold to a value that is higher than what can be caused by any single cable modem.

When using the **utilization** method, the system takes into account the relative throughput and bandwidth (as determined by the modulation profiles and channel widths) of each interface when evaluating the load on those interfaces. For example, if two upstreams are being load-balanced using the utilization method, and the first upstream has twice the bandwidth of the second upstream, the two upstreams are considered balanced when they reach the same percentage of utilization. The first upstream is carrying more traffic than the second upstream because it has a larger capacity for traffic, but the percentage of utilization will be the same.



Note Certain conditions can cause a system instability that could result in the Cisco CMTS endlessly attempting to load balance the interfaces. For example, this situation could occur in noisy environments, where cable modems drop offline on a regular basis, or when cable modems are repeatedly trying to register because the provisioning system has sent them the wrong DOCSIS configuration files. If the Cisco CMTS detects such unstable situations, it does not load balance cable modems from those interfaces until the system stabilizes. However, if the system instability persists, you should increase the threshold values using the **cable load-balance group threshold** command until you can solve the stability problems.

Use the **no** form of this command to delete a load-balance group. Deleting a load-balance group also automatically removes all upstream and downstream channel associations that were made with that group using the **cable load-balance** and **cable upstream load-balance** commands.



Tip To exclude individual cable modems from one or more types of load balancing, use the **cable load-balance exclude** command.

Examples

The following example shows how to create a load-balance group numbered 10, using the default method of **modem**, which specifies that the Cisco CMTS uses the actual number of cable modems that are online to determine load-balancing operations.

```
Router# config terminal
Router(config)# cable load-balance group 10

Router(config)#
```

The following example shows how to create a load-balance group numbered 1, which uses the number of active SFIDs on an interface to determine the current load on the interface:

```
Router# config terminal
Router(config)# cable load-balance group 1 method service-flows

Router(config)#
```

Related Commands

Command	Description
cable load-balance exclude	Excludes a particular cable modem, or all cable modems from a particular vendor, from one or more types of load-balancing operations.
cable load-balance group (interface configuration)	Assigns a downstream to a load-balance group.

Command	Description
cable load-balance group interval	Configures the frequency of the load-balancing policy updates.
cable load-balance group policy ugs	Configures how the Cisco CMTS should load balance cable modems with active unsolicited grant service (UGS) service flows.
cable load-balance group threshold	Configures the threshold values that a load-balance group should use for load-balancing operations.
cable upstream load-balance group	Assigns an upstream to a load-balance group.
clear cable load-balance	Clears the counters or state machine used to track load-balancing operations.
show cable load-balance	Displays real-time statistical and operational information for load-balancing operations.

cable load-balance group (interface)

To assign a downstream cable interface to a load balance group, use the **cable load-balance group** command in interface configuration mode. To remove a downstream from a load balance group, use the **no** form of this command.

cable load-balance group *n*
no cable load-balance group *n*

Syntax Description

<i>n</i>	Specifies the number of the load balance group to which the downstream should be assigned. In Cisco IOS Release 12.2(33)SCE3 and earlier, the range is from 1 to 80. In Cisco IOS Release 12.2(33)SCE4 and later, the range is from 1 to 256.
----------	---

Command Default

A downstream is not assigned to a load balance group. When you use this command to add a downstream to a group, it also automatically adds all the associated upstreams to the same group, unless you have also used the **cable upstream load-balance group** command to assign the upstreams to different groups.

Command Modes

Interface configuration—cable interface only (config-if)

Command History

Release	Modification
12.2(15)BC1	This command was introduced for the Cisco uBR7246VXR and Cisco uBR10012 routers.
12.2(33)SCE4	The valid range for the load balance group was changed.
IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The **cable load-balance group** command is used to configure the following features:

- [IGMP-Triggered Dynamic Channel Change Load Balancing for DOCSIS 2.0 Cable Modems](#)
- [Load Balancing and Dynamic Channel Change on the Cisco CMTS Routers](#)
- [Restricted/General Load Balancing and Narrowband Dynamic Bandwidth Sharing with Downstream Dynamic Load Balancing](#)

After you have used the **cable load-balance group (global configuration)** command to initially create and configure a load balance group, use the **cable load-balance group (interface configuration)** command to assign this load balance group to a downstream. This enables the cable interface to begin participating in load-balancing operations.



Tip Use the **cable upstream load-balance group** command to assign this load balance group to an upstream.

The following rules apply when creating and assigning load balance groups:

- A downstream or upstream can belong to only one load balance group.
- All downstreams and upstreams in a load balance group must share physical radio frequency (RF) connectivity to the same group of cable modems. Downstreams can be in a separate load balance group

than upstreams, but all downstreams or all upstreams that have the same RF physical connectivity must be members of the same load balance group. You cannot distribute downstreams or upstreams that share physical connectivity across multiple load balance groups.



Note If both downstreams and upstreams are assigned to the same load balance group, the Cisco CMTS attempts to balance both the downstream and upstream values when it moves cable modems.

- If the load balance group includes downstream interfaces, you must also configure the downstream center frequency on those interfaces, using the **cable downstream frequency** cable interface command. This command is informational-only on cable interfaces that use an external upconverter, but it is required for load balancing, so that the Cisco CMTS knows where to move cable modems when it is load balancing downstreams.
- Load balancing is done only on a per-chassis basis—all interfaces in a load balance group must be in the same chassis.



Note In Cisco IOS Release 12.2(15)BC1, you can configure an interface for both load balancing and Hot-Standby Connection-to-Connection (HCCP) N+1 redundancy, but load balancing does not continue after a switchover from a Working to a Protect interface. Load balancing resumes when the Cisco CMTS switches back to the Working interface.

Examples

The following example shows how to assign the first downstream on the cable interface line in slot five to load balance group 5:

```
Router# configure terminal
Router(config)# interface cable 5/0
Router(config-if)# cable load-balance group 5

Router(config-if)#
```

Related Commands

Command	Description
cable load-balance exclude	Excludes a particular cable modem, or all cable modems from a particular vendor, from one or more types of load-balancing operations.
cable load-balance group (global configuration)	Creates and configures a load balance group.
cable load-balance group interval	Configures the frequency of the load balancing policy updates.
cable load-balance group policy ugs	Configures how the Cisco CMTS should load balance cable modems with active unsolicited grant service (UGS) service flows.
cable load-balance group threshold	Configures the threshold values that a load balance group should use for load-balancing operations.

Command	Description
cable upstream load-balance group	Assigns an upstream to a load balance group.
clear cable load-balance	Clears the counters or state machine used to track load balancing operations.
show cable load-balance	Displays real-time statistical and operational information for load balancing operations.

cable load-balance group (Supporting Dynamic Channel Change)

To set multiple parameters for Load Balancing with Dynamic Channel Change (DCC), use the following command in global configuration mode. To remove this configuration, use the **no** form of this command.

```
cable load-balance group group-num {dcc-init-technique | interval | method | policy | threshold}
no cable load-balance group group-num {dcc-init-technique | interval | method | policy | threshold}
```

Syntax Description

dcc-init-technique	Sets DCC initialization technique
interval	Sets interface polling interval
method	Sets upstream load balancing type/method
policy	Sets load balancing policy
threshold	Load balancing threshold in percentage

Command Default

Load balancing is not configured by default on the Cisco CMTS.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.3(17a)BC	This command was introduced on the Cisco uBR10012 router and the Cisco uBR7246VXR router, with supporting broadband processing engines (BPEs) or cable interface line cards on the respective routers.
IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Examples

The following example illustrates configuration of the initialization techniques specified for DCC:

```
Router(config)# cable load-balance group 1 dcc-init-technique 4
```

For further examples of this command, and related keywords, refer to related commands, and refer also to *Configuring Load Balancing and Dynamic Channel Change (DCC) on the Cisco CMTS*.

Usage Guidelines

This command is subject to the restrictions and prerequisites described in *Configuring Load Balancing and Dynamic Channel Change (DCC) on the Cisco CMTS*.

Related Commands

Command	Description
cable load-balance group dcc-init-technique (Supporting Dynamic Channel Change)	Sets the initialization technique for Dynamic Channel Change (DCC) for Load Balancing.

Command	Description
cable load-balance group policy (Supporting Dynamic Channel Change)	Sets the type of service flow for use with Load Balancing and DCC, whether PacketCable MultiMedia (PCMM) or Unsolicited Grant Service (UGS).
cable load-balance group threshold (Supporting Dynamic Channel Change)	Sets the threshold levels for corresponding service flow types for the specified Load Balancing group, supporting Dynamic Channel Change (DCC)
show controllers cable	Displays statistics for Dynamic Channel Change (DCC) for load balancing.
test cable dcc (Supporting Dynamic Channel Change)	Performs testing functions for Load Balancing with DCC

cable load-balance group interval

To configure the frequency of the load-balancing policy updates, use the **cable load-balance group interval** command in global configuration mode. To reset the frequency of the policy updates to its default values, use the **no** form of this command.

cable load-balance group *n* interval *interval*
no cable load-balance group *n* interval

Syntax Description

<i>n</i>	Specifies the number of the load balance group. In Cisco IOS Release 12.2(33)SCE3 and earlier, the range is from 1 to 80. In Cisco IOS Release 12.2(33)SCE4 and later, the range is from 1 to 256.
<i>interval</i>	Specifies the frequency, in seconds, for how often the Cisco CMTS router should determine the current load on each cable interface. This also determines the minimum time between when cable modems can be moved to load balance the interfaces. One cable modem at most is moved during each interval time period. The range is from 1 to 1000. The default is 10 in Cisco IOS Release 12.2(33)SCE and earlier. The default is 30 in Cisco IOS Release 12.2(33)SCE1 and later.

Command Default

Each load balance group uses the default interval value, if the interval time period is not specified.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(15)BC1	This command was introduced for the Cisco uBR7246VXR and Cisco uBR10012 routers.
12.2(33)SCE1	The default value for the interval keyword was changed from 10 seconds to 30 seconds.
12.2(33)SCE4	The valid range for the load balance group was changed.
IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The **cable load-balance group interval** command is used to configure the following feature:

- [Load Balancing and Dynamic Channel Change on the Cisco CMTS Routers](#)

To perform load balancing, the Cisco CMTS must determine the actual load on an interface on a periodic basis. This frequency of the updates also determines how frequently cable modems can be moved to achieve balanced loads. One cable modem, at most, is moved during each update period.

The more often these updates are performed, the more accurate the Cisco CMTS can be in performing its load balancing operations. As a general rule, begin with the default frequency value, and then adjust the value accordingly, in small increments, as load balancing conditions or performance levels might require. The default interval value was changed in Cisco IOS Release 12.2(33)SCF to reduce thrashing of cable modems when utilization-based method is used with DOCSIS load balancing.



Note Having too small an interval could result in cable modems being constantly moved to achieve balanced loads during peak usage times when load balance could spike to transient heavy traffic. Also, more frequent updates can have a performance impact, especially on routers with a large number of active interfaces and cable modems.

Examples

The following example shows how to configure load-balance group 3 so that it performs a policy update every 30 seconds:

```
Router# configure terminal
Router(config)# cable load-balance group 3 interval 30

Router(config)#
```

The following example shows how to reset load-balance group 10 to its default update frequency of 10 seconds:

```
Router# configure terminal
Router(config)# no cable load-balance group 10 interval
Router(config)#
```

Related Commands

Command	Description
cable load-balance exclude	Excludes a particular cable modem, or all cable modems from a particular vendor, from one or more types of load-balancing operations.
cable load-balance group (global configuration)	Creates and configures a load-balance group.
cable load-balance group (interface configuration)	Assigns a downstream to a load-balance group.
cable load-balance group policy ugs	Configures how the Cisco CMTS should load balance cable modems with active unsolicited grant service (UGS) service flows.
cable load-balance group threshold	Configures the threshold values that a load-balance group should use for load-balancing operations.
cable upstream load-balance group	Assigns an upstream to a load-balance group.
clear cable load-balance	Clears the counters or state machine used to track load-balancing operations.
show cable load-balance	Displays real-time statistical and operational information for load-balancing operations.

cable load-balance group policy

The following command is introduced to the Cisco CMTS starting in Cisco IOS Release 12.2(17b)BC4.

To set the type of service flow policy for use with Load Balancing, use the following command in global configuration mode. This enhancement synchronizes the pending statistic between different cable interface line cards in the load balancing group. The result is an alternative downstream load balancing scheme that makes use of per-upstream loads rather than total downstream loads.

To remove this configuration, use the **no** form of this command.

cable load-balance group *ds-lb-group-id* **policy** *us-groups-across-ds*
no cable load-balance group *ds-lb-group-id* **policy** *us-groups-across-ds*

Syntax Description

<i>ds-lb-group-id</i>	Specifies the load balancing group being configured. This downstream group includes the upstream segment in load balancing decisions.
<i>us-groups-across-ds</i>	Specifies the upstream group to be distributed in load balancing decisions for the downstream group specified.

Command Default

By default, this load balancing configuration is not enabled on the Cisco CMTS.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(17b)BC4	This command was introduced on the Cisco uBR10012 router and the Cisco uBR7246VXR router, with supporting broadband processing engines (BPEs) or cable interface line cards on the respective routers.
IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Examples

The following example illustrates this command and one supported implementation:

```
Router(config)# cable load-balance group 1 policy 2
Router(config)#
```

In this example, a cable modem that comes online on the interface cable 5/0 Upstream 2 could potentially come online on the following interfaces:

- cable 3/0 upstream 2
- cable 4/0 upstream 2
- cable 6/0 upstream 2
- nowhere else, however

With downstream load balancing prior to Cisco IOS Release 12.2(17b)BC4, having 100 cable modems per segment would be possible in an extreme case that distributes cable modems as follows:

	U0	U1	U2	U3	Downstream
3/0	97	1	1	1	100
4/0	1	97	1	1	100
5/0	1	1	97	1	100
6/0	1	1	1	97	100

Usage Guidelines

This command is subject to the restrictions and prerequisites described in *Configuring Load Balancing and Dynamic Channel Change (DCC) on the Cisco CMTS*.

Cisco IOS Release 12.2(17b)BC4 enables the optional operation of making downstream load balancing decisions as follows:

- The target downstream segment is in the same downstream load balancing group as the source downstream segment.
- The upstream load balancing group can be set for the corresponding channel on which a cable modem is balanced.
- The Cisco CMTS automatically locates the upstream segment for a load balancing group and processes the upstream group status on the source interface that has the lowest load.
- The target downstream segment must have an upstream channel set in the upstream load balancing group.
- The highest target upstream segment must carry less load than any other potential target—the highest upstream segment on other interfaces.

This command enables an alternative downstream load balancing scheme that makes use of per-upstream loads rather than total downstream loads.

This enhancement performs downstream load balancing that accounts upstream channel loads in the same upstream load balancing group, rather than on the basis of the entire downstream channel load. Prior Cisco IOS releases may not have distributed cable modems evenly over individual upstream channels, nor in a way that accounted for downstream and upstream together.

This enhancement applies when downstream load balancing occurs on a headend system with separate upstream load balancing segments; the upstream segments are spread over multiple downstreams segments.

This optional configuration supports output of the **show cable load-balance** command so that the command displays more information about loads on channels that are configured on external or remote cable interface line cards.

Related Commands

Command	Description
show cable load-balance	Displays information about loads on channels that are configured on external or remote cable interface line cards, to include integrated per-upstream load balancing information.

cable load-balance group policy ugs

To configure whether the Cisco CMTS should load balance cable modems with Unsolicited Grant Service (UGS) service flows (which are typically used for active voice calls), use the **cable load-balance group policy ugs** command in global configuration mode. To reset the load-balance group to its default policy setting, use the **no** form of this command.

cable load-balance group *n* policy ugs
no cable load-balance group *n* policy ugs

Syntax Description

<i>n</i>	Specifies the number of the load-balance group. In Cisco IOS Release 12.2(33)SCE3 and earlier, the valid range is from 1 to 80. In Cisco IOS Release 12.2(33)SCE4 and later, the valid range is from 1 to 256.
----------	--

Command Default

Cable modems with active UGS service flows can be moved for load-balancing (**cable load-balance group *n* policy ugs**)

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(15)BC1	This command was introduced for the Cisco uBR7246VXR and Cisco uBR10012 routers.
12.2(33)SCE4	The valid range for the load balance group was changed.
IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The **cable load-balance group policy ugs** command determines whether a load-balance group can move cable modems with UGS service flows, so as to enforce dynamic load balancing policies. Because most voice calls use UGS service flows to allow real-time traffic, this option is primarily used to determine whether the Cisco CMTS will move cable modems with active voice calls.

If you disable this option (**no cable load-balance group policy ugs**), the Cisco CMTS does not move cable modems with active UGS service flows to a new upstream or downstream. This prevents some possible interruptions of service to these customers, but it could result in denial of service conditions for other customers if the interface starts becoming overloaded.

To avoid this, the default configuration (**cable load-balance group policy ugs**) of this command allows the Cisco CMTS to move cable modems to a new upstream or downstream, even if they have active UGS service flows. This enables the Cisco CMTS to perform optimum load balancing, but it could cause a momentary interruption in the voice call—users on the voice call might hear a momentary drop during the call, but the call should not be terminated.



Note The **cable load-balance group policy ugs** command affects only dynamic load-balancing operations and does not affect static and passive load-balancing operations. Dynamic load balancing is enabled using the **enforce** option with the **cable load-balance group threshold** command.

Examples

The following example shows how to enable the UGS policy on a load-balance group (the default configuration), so that the Cisco CMTS can move cable modems with active UGS service flows as needed to enforce the current dynamic load balancing policy:

```
Router# config terminal
Router(config)# cable load-balance group 13 policy ugs

Router(config)#
```

The following example shows how to configure a load-balance group so that the Cisco CMTS does not move cable modems with active UGS service flows (default configuration):

```
Router# config terminal
Router(config)# no cable load-balance group 100 policy ugs

Router(config)#
```

The **cable load-balance group policy ugs** command is used to configure the following feature:

- [Load Balancing and Dynamic Channel Change on the Cisco CMTS Routers](#)

Related Commands

Command	Description
cable load-balance exclude	Excludes a particular cable modem, or all cable modems from a particular vendor, from one or more types of load-balancing operations.
cable load-balance group	Creates and configures a load-balance group.
cable load-balance group (interface)	Assigns a downstream to a load-balance group.
cable load-balance group interval	Configures the frequency of the load-balancing policy updates.
cable load-balance group threshold	Configures the threshold values that a load-balance group should use for load-balancing operations.
cable upstream load-balance group	Assigns an upstream to a load-balance group.
clear cable load-balance	Clears the counters or state machine used to track load-balancing operations.
show cable load-balance	Displays real-time statistical and operational information for load-balancing operations.

cable load-balance group threshold

To configure the threshold values that a load-balance group should use for load-balancing operations, use the **cable load-balance group threshold** command in global configuration mode. To reset the load-balance group to its default threshold values, use the **no** form of this command.

cable load-balance group *n* threshold {**load** *load-value* [**enforce** *threshold*] | **load minimum** *number* | **stability** *percent* | **ugs** *band-value*}

Syntax Description

<i>n</i>	Specifies the number of the load-balance group. In Cisco IOS Release 12.2(33)SCE3 and earlier, the valid range is from 1 to 80. In Cisco IOS Release 12.2(33)SCE4 and later, the valid range is from 1 to 256.
load <i>load-value</i>	Specifies the maximum load difference, as expressed in a percentage of total load, that can exist between interfaces in a load-balance group before the Cisco CMTS performs load balancing. If the load between interfaces is greater than the value specified by <i>load-value</i> , cable modems that are registering are assigned to the lesser-utilized interface until the load difference is once again below this value. The valid range for <i>load-value</i> is 1 to 100 percent, with a default of 10 percent. Note The default of 10 percent is the minimum recommended threshold. Do not set this threshold below 10 percent unless you have been instructed to do so by Cisco TAC.
enforce <i>threshold</i>	(Optional) Enables dynamic load balancing, which moves online cable modems after their initial registration to achieve load balancing of the cable interfaces in a load-balance group. Cable modems that are currently online are moved when the load difference between two interfaces in the load-balance group exceeds this percentage. Modems continue to be moved until the load difference falls below this value. The possible valid range for <i>threshold</i> is 1 to 100 percent, but the <i>threshold</i> must be equal to or greater than the percentage specified with the <i>load-value</i> option. For this reason, the actual minimum for <i>threshold</i> is the current setting of the <i>load-value</i> option. The default is also the same value as the <i>load-value</i> parameter.
load minimum <i>number</i>	(Optional) Specifies that cable modems should be moved only if the load between the two interfaces is greater than the specified number of cable modems or service flows (valid only when the method is the number of modems or service flows). The valid range is 1 to 100, with a default of 5.
stability <i>percent</i>	Specifies the threshold to be used to determine whether a channel or interface is unstable, in terms of the percentage of successful ranging requests. The <i>percent</i> value specifies the minimum percentage of successful ranging requests that is acceptable; otherwise, the CMTS begins moving CMs. The valid range is 1 to 100 percent, with a default of 50 percent.

ugs <i>band-value</i>	<p>Specifies that the Cisco CMTS should move cable modems with active UGS service flows when the current UGS usage reaches the percentage of total bandwidth available that is specified by the <i>band-value</i> parameter. The valid range for <i>band-value</i> is 0 to 100 percent, with a default of 70 percent.</p> <p>Note This option is effective only when the enforce option has also been used to enable dynamic load balancing, and the Cisco CMTS has been authorized to move cable modems with active UGS service flows (using the cable load-balance group policy ugs command).</p>
------------------------------	--

Command Default

The **load** parameter defaults to 10 percent, the **load minimum** parameter defaults to 5, the **stability** parameter defaults to 50 percent, and the **ugs** parameter defaults to 70 percent. By default, only static load balancing is done (**no enforce** option). If the **enforce** option is given without a threshold value, it defaults to the same value as the **load** parameter.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(15)BC1	This command was introduced for the Cisco uBR7246VXR and Cisco uBR10012 routers.
12.2(33)SCE4	The valid range for the load balance group was changed.
IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The **cable load-balance group threshold** command is used to configure the following feature:

- [Load Balancing and Dynamic Channel Change on the Cisco CMTS Routers](#)

The **cable load-balance group threshold** command configures a load-balance group for the threshold values that it should use to determine when a cable modem should be moved to a new downstream or upstream. You can specify the following different thresholds:

- **load**—Specifies the maximum load usage that can exist between interfaces in a load-balance group before the Cisco CMTS begins static load-balancing operations. The default value of *load-value* is 10 percent, which means that two upstreams or two downstreams can have usage rates that vary up to 10 percent before the Cisco CMTS begins rebalancing the load usage. This rebalancing, however, is done only when cable modems first register with the Cisco CMTS—the Cisco CMTS does not switch cable modems that are already online.

For example, if the **load** value is 10 percent, and upstream 1 is at 23 percent and upstream 2 is at 30 percent, no cable modems are moved. However, if load usage for upstream 2 reaches 35 percent, the Cisco CMTS begins assigning new cable modems, as they register, to upstream 1 until the difference in load usage between the two upstreams falls below 10 percent.



Note The default of 10 percent is the minimum recommended threshold. Do not set this threshold below 10 percent unless you have been instructed to do so by Cisco TAC.

- **enforce**—Enables dynamic load balancing, so that the Cisco CMTS can move cable modems that are already online. This option has its own threshold value, which specifies the difference in load usage that must exist between two interfaces in a group before the Cisco CMTS begins moving online cable modems. The Cisco CMTS continues to move cable modems until the difference in load usage rates falls below the threshold value.

When using dynamic load balancing and an upstream channel is overloaded, the Cisco CMTS sends an Upstream Channel Change (UCC) request to a cable modem to instruct it to move to another upstream. The cable modem should move to the new upstream channel, without going offline or having to reregister with the CMTS.

When using dynamic load balancing and a downstream channel is overloaded, the Cisco CMTS sends a stop response to a cable modem's ranging request (RNG-REQ) message. When the cable modem sends a new REG-REQ message, the Cisco CMTS specifies the new downstream channel in the Downstream Frequency Override field in its REG-RSP message. The cable modem must go offline and reregister on the new downstream channel, so as to conform to the DOCSIS 1.0 specifications.



Note In Cisco IOS Release 12.2(15)BC1, the dynamic load balancing method results in cable modems going offline and having to reregister whenever the modems are moved between downstreams. This is because the DOCSIS 1.0 specification requires cable modems to reregister whenever the downstream is changed using the Downstream Frequency Override message. Cable modems should not go offline when moved between upstreams.

The Cisco CMTS also continues to enforce the load threshold value to perform static load balancing as well. Therefore, the *threshold* percentage should be equal to or greater than the percentage specified with the **load load-value** option.

For example, if you specify **load 10 enforce 15**, the Cisco CMTS monitors the load usage between cable interfaces in the load-balance group. If upstream 1 reaches 33 percent and upstream 2 reaches 45 percent, the Cisco CMTS begins static load-balancing operations by assigning new cable modems to upstream 1 when they register. If the difference still continues to grow, and upstream 2 reaches 50 percent, the Cisco CMTS also begins dynamic load-balancing operations by moving online cable modems, until the difference in load usage falls below 15 percent. The Cisco CMTS then continues static load-balancing operations until the difference falls below 10 percent.



Tip The **enforce** threshold is not displayed in the configuration file if it is the same as the **load** threshold. For example, if you enter the **cable load-balance group 1 threshold load 50 enforce 50** command, it appears as **cable load-balance group 1 threshold load 50 enforce** in the configuration file.

- **load minimum**—Specifies that cable modems should be moved only if the load between the two interfaces is greater than the specified number of cable modems or service flows. This option is valid only when you have configured the load-balance group using either the **method modem** or **method service-flows** options with the **cable load-balance group** command. It is not used with the **utilization** method.
- **stability**—Specifies the minimum percentage of ranging requests that are successful before the Cisco CMTS determines that the interface or channel is unstable. When the channel has fewer than this percentage of cable modems responding to periodic ranging requests over a one-minute period, the Cisco CMTS begins moving modems to other channels in the load-balance group. For example, when set to 75 percent, the Cisco CMTS begins moving modems when fewer than 75 percent of modems are replying to ranging requests.

- **ugs**—Specifies a threshold for when the Cisco CMTS should move cable modems that have active UGS service flows, which are typically used for active voice calls. This option goes into force only when dynamic load balancing has been enabled (using the **enforce** option), and the Cisco CMTS has been allowed to move cable modems with active UGS service flows (using the **cable load-balance group policy ugs** command). The *band-value* threshold specifies the maximum usage of UGS service flows that should exist before the Cisco CMTS begins moving calls.

For example, if the band-value threshold is at its default of 70 percent, the Cisco CMTS does not begin moving cable modems with active UGS service flows until UGS usage on an upstream or downstream reaches 70 percent of the total available bandwidth. The Cisco CMTS continues moving cable modems that are online with active UGS service flows until the UGS usage on the interface falls below 70 percent.



Note Certain conditions can cause a system instability that could result in the Cisco CMTS endlessly attempting to load balance the interfaces. For example, this situation could occur in noisy environments, where cable modems drop offline on a regular basis, or when cable modems are repeatedly trying to register because the provisioning system has sent them the wrong DOCSIS configuration files. If the Cisco CMTS detects such unstable situations, it does not load balance cable modems from those interfaces until the system stabilizes. However, if the system instability persists, you should increase the threshold values using the **cable load-balance group threshold** command until the system stabilizes.

Examples

The following example shows how to configure load-balance group 2 so that it performs static load balancing when the difference between two cable interfaces in the group is 20 percent or more.

```
Router# config terminal
Router(config)# cable load-balance group 2 threshold load 20
Router(config)#
```

The following example shows how to configure load-balance group 5 so that it performs static load balancing when the difference in usage between two cable interfaces in the group is 20 percent or more, and so that it performs dynamic load balancing when the difference in usage is 30 percent or more. The Cisco CMTS will also begin moving cable modems with active UGS service flows when UGS service flows reach 60 percent of the total bandwidth available on the upstream channel.

```
Router(config)# cable load-balance group 5 threshold load 20 enforce 30
Router(config)# cable load-balance group 5 threshold ugs 60
Router(config)# cable load-balance group 5 policy ugs
Router(config)#
```



Note You must configure the load-balance group with the **cable load-balance group policy ugs** command before the Cisco CMTS begins enforcing the threshold that was set with the **cable load-balance group threshold ugs** command.

Related Commands

Command	Description
cable load-balance exclude	Excludes a particular cable modem, or all cable modems from a particular vendor, from one or more types of load-balancing operations.
cable load-balance group	Creates and configures a load-balance group.
cable load-balance group (interface)	Assigns a downstream to a load-balance group.
cable load-balance group interval	Configures the frequency of the load-balancing policy updates.
cable load-balance group policy ugs	Configures how the Cisco CMTS should load balance cable modems with active unsolicited grant service (UGS) service flows.
cable upstream load-balance group	Assigns an upstream to a load-balance group.
clear cable load-balance	Clears the counters or state machine used to track load-balancing operations.
show cable load-balance	Displays real-time statistical and operational information for load-balancing operations.

cable load-balance group threshold (Supporting Dynamic Channel Change)

To set the threshold levels and corresponding service flow types for the specified Load Balancing group, supporting Dynamic Channel Change (DCC) on the Cisco router, use the following command in global configuration mode. To remove threshold settings, use the **no** form of this command.

cable load-balance group *n* **threshold** {load | pcmm | stability | ugs} {0-100}

cable load-balance group *n* **threshold** ugs <1-100>

cable load-balance group *n* **threshold** load <1-100> {minimum}

cable load-balance group *n* **threshold** load 75 {enforce}

Syntax Description

<i>n</i>	Specifies the number of the load balance group. In Cisco IOS Release 12.2(33)SCE3 and earlier, the valid range is from 1 to 80. In Cisco IOS Release 12.2(33)SCE4 and later, the valid range is from 1 to 256.
load	Interface load threshold settings
pcmm	PCMM service flow threshold
stability	Threshold for stability detection
ugs	UGS service flow threshold
<i>1-100</i>	Interface utilization threshold in percentage of interface capacity.
load	Interface load threshold settings
<i>1-100</i>	Threshold value in percentage
minimum	Set minimum number of modems/flows difference before loadbalancing starts
enforce	Enters the enforce threshold

Command Default

Load balancing is not configured by default on the Cisco CMTS.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.3(17a)BC	This command was introduced on the Cisco uBR10012 router and the Cisco uBR7246VXR router, with supporting broadband processing engines (BPEs) or cable interface line cards on the respective routers.
12.2(33)SCE4	The valid range for the load balance group was changed.
IOS-XE 3.15.OS	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Examples

The following command specifies the reserved bandwidth threshold. Above this level, cable modems with active PCMM service flows participate in load balancing, and the default threshold is 70%. Note that if UGS is used for PCMM, the UGS threshold needs to be crossed as well. The default UGS threshold is 70%

```
Router(config)# cable load-balance group 4 threshold pcmm <pcmm-value>
```

Usage Guidelines

In Cisco IOS releases prior to Cisco IOS Release 12.3(17a)BC, the load balancing default setting is UGS. This is not the case with Cisco IOS Release 12.3(17a)BC. In this latter release, and subsequent releases, configuration is required if the cable modems with active UGS flows are desired to participate in load balancing.

This command is subject to the restrictions and prerequisites described in *Configuring Load Balancing and Dynamic Channel Change (DCC) on the Cisco CMTS*.

The **cable load-balance group threshold** command is used to configure the following feature:

- [Load Balancing and Dynamic Channel Change on the Cisco CMTS Routers](#)

Related Commands

Command	Description
cable load-balance group (Supporting Dynamic Channel Change)	Sets multiple parameters for Load Balancing with DCC.
cable load-balance group dcc-init-technique (Supporting Dynamic Channel Change)	Sets the initialization technique for Dynamic Channel Change (DCC) for Load Balancing.
cable load-balance group policy (Supporting Dynamic Channel Change)	Sets the type of service flow for use with Load Balancing and DCC, whether PacketCable MultiMedia (PCMM) or Unsolicited Grant Service (UGS).
show controllers cable	Displays statistics for Dynamic Channel Change (DCC) for load balancing.

cable load-balance method-utilization min-threshold

To configure the minimum threshold for initiating load balancing under the utilization method , use the **cable load-balance method-utilization min-threshold** command in global configuration mode.

cable load-balance method-utilization min-threshold *min_threshold*

Syntax Description	<i>min_threshold</i> (Optional) Specifies the minimum threshold value in percentage, of utilization to initiate load balancing. The valid range is from 10 to 90. The default value is 25.
---------------------------	--

Command Default The minimum utilization threshold is 25 percent.

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(33)SCH	This command was introduced.
	IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Examples

The following example shows how to configure the **cable load-balance method-utilization min-threshold** *min_threshold* command:

```
Router# enable
Router(config)# cable load-balance method-utilization min-threshold
40
Router(config)# exit
```

Related Commands	Command	Description
	cable load-balance group threshold	Configures the threshold values that a load-balance group should use for load-balancing operations

cable load-balance modem max-failures

To configure the number of times a CM can fail before the CM is removed from the dynamic load balancing group, use the **cable load-balance modem max-failures** command in the global configuration mode. To remove the configured number for a CM to fail, use the **no** form of this command.

cable load-balance modem max-failures*0-100*

no cable load-balance modem max-failures

Syntax Description

<i>0-100</i>	Specifies the maximum number of failures before a CM is removed from the dynamic LB. However, if you give the value 0, the cable load-balance modem max-failures command gets disabled.
Note	The CM is excluded from the dynamic load balance operations after it has failed the specified number of times, however it still belongs to a LBG.

Command Default

The default value is 10.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCC	This command was introduced.
IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Examples

The following example shows how to configure CM using the **cable load-balance modem max-failures** command.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
cable load-balance modem max-failures 10
Router(config)#
```

cable load-balance restrict modem

To configure a list of cable modems statically provisioned at the CMTS to a restricted load balancing group (RLBG) or a service type ID, use the **cable load-balance restrict modem** command in the global configuration mode. To remove the configured list of cable modems, use the **no** form of this command.

```
cable load-balance restrict modem index mac-addr [mac-mask] {docsis-group docsis-group-id | service-type-id string}
no cable load-balance restrict modem index mac-addr [mac-mask] {docsis-group docsis-group-id | service-type-id string}
```

Syntax Description		
	<i>index</i>	Assigns an index number ranging from 1 to 4294967295.
	<i>mac-addr</i>	Specifies the MAC address of the modem that is restricted.
	<i>mac-mask</i>	Specifies the MAC mask of the modem that is restricted.
	docsis-group <i>docsis-group-id</i>	Restricts modems to a DOCSIS load balancing group.
	service-type-id <i>string</i>	Restricts modems to a service type ID.

Command Default None

Command Modes Global configuration (config)

Command History	Release	Modification
	12.2(33)SCC	This command was introduced.
	IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Examples

The following example shows how to assign a group of modems with a common MAC mask to a group or a service type ID using the **cable load-balance restrict modem** command. To assign the modem to a LBG, you can either specify the LBG ID or the service type ID.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance restrict modem 1 001a.c30c.7eee FFFF.FFFF.0000 docsis-group
100
Router(config)#
```

cable load-balance rule

To create a rule that prevents cable modem (CM) from disabling or enabling load balancing, use the **cable load-balance rule** command in cable global configuration mode. To remove a defined rule, a rule from all policies, or the policy itself if it is the last rule of that policy, use the **no** form of this command.

```
cable load-balance rule rule-id {disable-period dis-start start-time dis-period disable-period |
disable-throughput-lowerbound {ds n | us n} | disabled | enabled | vdoc-enabled}
no cable load-balance rule rule-id
```

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```
cable load-balance rule rule-id {disable-period dis-start start-time dis-period disable-period |
disable-throughput-lowerbound {ds n | us n} | disabled | enabled}
```

Syntax Description

<i>rule-id</i>	Specifies the rule to load balance CM.
disable-period	Specifies the number of seconds to prevent CM from load balancing at a given start time.
dis-start <i>start-time</i>	Specifies the start time to disable CM from load balancing. The dis-start is the start time ranging from 0 to 86400 seconds from midnight.
dis-period <i>disable period</i>	Specifies the period to disable CM from load balancing. The dis-period is the duration time ranging from 0 to 86400 seconds from midnight.
disable-throughput-lowerbound	Disables load balancing if CM throughput is lower than a threshold.
ds <i>n</i> us <i>n</i>	Specifies downstream or upstream channels throughput lowerbound in kbps, ranging from 0 to 1000000.
disabled	Disables the CM from load balancing.
enabled	Enables load balancing on CM.
vdoc-enabled	(For Cisco uBR10012 Router and Cisco uBR7200 Series Routers) Enables the video over DOCSIS (VDOC) load balancing for static multicast groups.

Command Default

None

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCB	This command was introduced.
12.2(33)SCC	The disable-throughput-lowerbound parameter was added in the command.
12.2(33)SCD5	The vdoc-enabled parameter was added in the command.

Release	Modification
IOS-XE 3.15.0S	This command was integrated into Cisco IOS-XE Release 3.15.0S. Support for the Cisco cBR Series Converged Broadband Routers was added.

Usage Guidelines

The **cable load-balance rule** *rule-id* **disable-period** **dis-start** *start-time* **dis-period** *disable-period* command can be used for a 24 hours period.



Important You cannot disable load balancing and enable it for the next day using a single rule. You must configure two separate rules using the **cable load-balance rule** *rule-id* **disable-period** **dis-start** *start-time* **dis-period** **0** command to disable it and the **cable load-balance rule** *rule-id* **disable-period** **dis-start** **0** **dis-period** *disable-period* command to enable it for the next day.

The **no** form of this command supports the following actions:

- Remove a defined rule.
- Remove the rule from all policies.
- Remove the policy itself if it is the last rule of that policy.



Note Static multicast groups must be configured on the specific bundle interface as well as on the correct forwarding interfaces to enable the **vdoc-enabled** rule.

Examples

The following example shows how to create a rule:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# cable load-balance rule 1 disable-period dis-start 40 dis-period 50
Router(config)# cable load-balance rule 1 disable-throughput-lowerbound ds 2500
Router(config)# cable load-balance rule 1 disabled
Router(config)# cable load-balance rule 2 enabled
Router(config)# cable load-balance rule 1 vdoc-enabled
Router(config)#
```

Related Commands

Command	Description
cable load-balance docsis-policy	Creates a DOCSIS policy and associates a new or existing rule with the policy.

cable load-balance static cm-delay

To configure the delay time to trigger static load balancing on the cable modem after registration hold-off time ends, use the **cable load-balance static cm-delay** command.

cable load-balance static cm-delay *delay*

Syntax Description *delay* Cable modem delay time in seconds for static load balancing to trigger after registration hold. Valid delay range is 0–65535.

Command Default By default, the cable modem delay time is 600 seconds.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Amsterdam 17.3.1w	This command was introduced.

Usage Guidelines When you set cable modem delay time to 0, successful registration triggers static load balancing instantly after registration hold off time ends.

Examples The following example shows how to set load balancing cm-delay to 60 seconds.

```
Router#configure terminal
Router(config)#cable load-balance static cm-delay 60
Router(config)#end
```

cable logging badipsource

To log error messages about bad IP source addresses on the cable interfaces to a separate log buffer, use the **cable logging badipsource** command in global configuration mode. To turn off the logging function and clear out the buffer, so that any error messages are logged to the console or current system log, use the **no** form of this command.

cable logging badipsource [*buffer-size*]
no cable logging badipsource

Syntax Description

<i>buffer-size</i>	Specifies the total size of the buffer that contains the logged error messages, in bytes. The range is from 4096 to 1048576 (4 KB to 1 MB). The default is 4096.
	Note The maximum buffer size is limited by the amount of actual unused memory that is available on the Cisco CMTS.

Command Default

Error messages for bad IP source addresses are logged to the console or current system log. The default logging buffer size is 4096 entries.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.1(13)EC	This command was introduced for the Cisco uBR7100 series and Cisco uBR7200 series universal broadband routers.
12.2(11)CY	Support was added for the Cisco uBR10012 universal broadband router.
12.2(11)BC2	Support was added to the Release 12.2 BC train for the Cisco uBR7100 series, Cisco uBR7200 series, and Cisco uBR10012 routers.
12.2(15)BC1, 12.2(15)CX	The maximum buffer size was adjusted to 1 MB, which can contain approximately 2000 error messages. Also, if the requested amount of memory is not available in a contiguous block, the CMTS displays an error message and does not change the buffer size.
IOS-XE 3.15.OS	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The **cable source-verify** command enables service providers to verify that the IP addresses being used on the cable interface have been properly assigned by the provider's DHCP servers. When a bad IP address is detected, the Cisco CMTS generates a BADIPSOURCE error message in the console logs.

In previous Cisco IOS releases, the Cisco CMTS generated these particular error messages for every IP packet that contained a bad IP source address. This can create a large volume of error messages that can make it difficult to see other error messages in the console logs.

To create a separate log for these error messages, use the **cable logging badipsource** command. You can also specify the size of the buffer that contains these error messages. When the buffer becomes full, the oldest

messages are deleted to make room for newer messages, so choose a buffer size that allows you to retain all messages until you can examine them.

On the Cisco uBR10012 router, this command includes only the BADIPSOURCE error messages generated by the PRE module. The cable interface line cards also generate their own error messages, but because these error messages are typically duplicates of the ones generated by the PRE module, they are not included in the separate log.



Tip If you find that the current buffer is too small to contain the current volume of error log messages, you can issue this command again with a larger buffer size. However, doing so automatically clears out all messages currently in the buffer, so ensure that you have viewed all the current messages before giving a second **cable logging badipsource** command.



Note Be cautious when specifying the buffer size, because the Cisco CMTS could run out of memory for other tasks. Use the **show memory EXEC** command to display the maximum available processor memory, and set the buffer size for this command to a value well within that maximum value.

To display the contents of this error log, use the **show cable logging** command. To clear the buffer after you have viewed the error messages, use the **clear cable logging** command. You can also use the **service timestamps log** command to add a timestamp to the messages in the log.

To print the BADIPSOURCE messages to the console or syslog server, use the **no cable logging badipsource** command (which is the default configuration). Note that this configuration does not turn off the generation of BADIPSOURCE messages, but only configures the system for the default log message behavior.



Tip If you do not want to see any BADIPSOURCE messages at all, use the **cable logging badipsource 4096** command so that these messages go to a separate buffer with the smallest possible size. You will then not see these error messages unless you explicitly use the **show cable logging** command to display them.

Examples

The following example shows how to enable the logging of bad IP source address error messages, using a buffer size of 524,288 bytes (512 KB):

```
Router# configure terminal
Router(config)# cable logging badipsource 524288
Router(config)#
```



Tip You must also use the **cable source-verify** command to enable verification of source IP addresses before the buffer contains any error messages about bad IP source addresses. If you do not use the **cable source-verify** command, you can still use the **cable logging badipsource** command to create a buffer, but the buffer always remains empty.

The following example shows how to enlarge the current buffer for bad IP source address error messages by giving the **cable logging badipsource** command a second time. Because this will empty

out the buffer of all current messages, be sure to display the current buffer contents before giving the command a second time.

```
Router# configure terminal
```

```
Router(config)# cable logging badipsource 8192
```

```
Router(config)# exit
```

```
Router# show cable logging badipsource
```

```
<<buffer contents omitted>>
```

```
Router# configure terminal
```

```
Router(config)# cable logging badipsource 256000
```

The following example shows how to stop the logging of bad IP source address error messages to a separate buffer. This clears out all error messages from the buffer and removes the buffer from memory, and future error messages for bad IP source addresses are logged to the console or to the current system log, if any.

```
Router# configure terminal
```

```
Router(config)# no cable logging badipsource
```

```
Router(config)#
```

Related Commands

Command	Description
cable source-verify	Enables verification of IP addresses for CMs and CPE devices on the upstream.
clear cable logging	Removes all error messages about bad IP source addresses on the cable interfaces from the error log buffer.
show cable logging	Displays the log of error messages about bad IP source addresses on the cable interfaces.

cable logging downstream-index

To enable logging for downstream indexes, use the **cable logging downstream-index** command in global configuration mode. To turn off logging and clear the buffer, use the **no** form of this command.

cable logging downstream-index [*buffer-size*]
no cable logging downstream-index [*buffer-size*]

Syntax Description

<i>buffer-size</i>	Total size of the buffer that contains the logged downstream indexes, in bytes. The range is from 4096 to 4121440. The default is 4096.
	Note The maximum buffer size is limited by the amount of actual unused memory that is available on the Cisco CMTS.

Command Default

The downstream indexes are logged on the line card on which this configuration is enabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SCG	This command was introduced.
IOS-XE 3.15.0S	This command is not supported on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

The **cable logging downstream-index** command is configured on the Cisco uBR-MC3GX60V or Cisco UBR-MC20X20V cable line cards or on the line card that is configured to be the modular-host for a SPA. The downstream index logging may be enabled on the cable line card that has the MAC domain.



Note This command is used to collect data only when requested by Cisco TAC.



Caution Be cautious when specifying the buffer size because the Cisco CMTS could run out of memory for other tasks. Use the **show memory EXEC** command to display the maximum available processor memory, and set the buffer size for this command to a value well within the maximum value.

To display the contents of the downstream index log, use the **show cable logging downstream-index** command. To clear the buffer after you have viewed the log, use the **clear cable logging downstream-index** command. You can also use the **service timestamps log** command to add a timestamp to the messages in the log.

Examples

The following example shows how to enable downstream index logging:

```
Router> enable
Router# configure terminal
Router(config)# cable logging downstream-index 4096
```

Related Commands

Command	Description
clear cable logging	Removes all downstream index log messages.
show cable logging	Displays all downstream index log messages

cable logging layer2events

To save selected (low priority) DOCSIS events that are specified in CMTS MIB Registry to the cable logging buffer (instead of to the general logging buffer), use the **cable logging layer2events** command in global configuration mode. To disable the logging of DOCSIS events to the cable logging buffer, use the **no** form of this command.

cable logging layer2events
no cable logging layer2events

Syntax Description

This command has no arguments or keywords.

Command Default

The DOCSIS events are saved to the general logging buffer on the Cisco CMTS. The default logging buffer size is 4096 entries.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.3(9a)BC	This command was introduced on the Cisco uBR10012 and Cisco uBR7246VXR universal broadband routers.
IOS-XE 3.15.0S	This command was implemented on the Cisco cBR Series Converged Broadband Routers.

Usage Guidelines

Use the **show cable logging** command to check whether the logging feature is enabled and the status of the logging buffer.

Examples

The following example shows how to clear the log buffer that contains a bad IP source address error messages:

```
Router# show cable logging summary
Cable logging: BADIPSOURCE Enabled
Total buffer size (bytes): 1000000
Used buffer size (bytes) : 36968
Logged messages : 231
Router# clear cable logging badipsource
Router# show cable logging summary
Cable logging: BADIPSOURCE Enabled
Total buffer size (bytes): 1000000
Used buffer size (bytes) : 0
Logged messages : 0
```

Related Commands

Command	Description
cable logging badipsource	Logs error messages about bad IP source addresses on the cable interfaces to a separate log buffer,

Command	Description
show cable logging	Indicates whether the logging feature is enabled and the status of the logging buffer.

