



## CHAPTER 9

# EtherChannel for the Cisco Cable Modem Termination System

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This document describes the features, benefits and configuration of Cisco EtherChannel technology on the Cisco Cable Modem Termination System (CMTS).

EtherChannel is a technology by which to configure and aggregate multiple physical Ethernet connections to form a single logical port with higher bandwidth. The first EtherChannel port configured on the Cisco CMTS serves as the EtherChannel bundle master by default, and each slave interface interacts with the network using the MAC address of the EtherChannel bundle master.

EtherChannel ports reside on a routing or bridging end-point. The router or switch uses EtherChannel to increase bandwidth utilization in either half- or full-duplex mode, and load balances the traffic across the multiple physical connections.

EtherChannel on the Cisco CMTS supports inter-VLAN routing with multiple devices and standards, and supports FastEtherChannel (FEC) and Gigabit EtherChannel (GEC) on the Cisco CMTS depending on the router and associated processing modules in the chassis.

### Feature History for EtherChannel on the Cisco CMTS

Release	Modification
12.2(11)BC3	FEC and GEC support was introduced on the Cisco uBR7246VXR router with the NPE-G1 network processing engine required for GEC.
12.2(9a)BC	GEC support was introduced on the Cisco uBR10012 universal broadband router with the Cisco uBR10012 PRE2 performance routing engine.

### Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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## Prerequisites for EtherChannel on the Cisco CMTS

The Cisco uBR10012 universal broadband router has the following prerequisites to support GEC and 802.1Q encapsulation for inter-VLAN trunking, also summarized in [Table 1](#):

- Cisco IOS Release 12.2(9a)BC or a later BC release.
- The Cisco uBR10012 router supports only GEC with PRE2 performance routing engine modules.

The Cisco uBR7246VXR universal broadband router has the following prerequisites to support FEC or GEC and 802.1Q encapsulation for inter-VLAN trunking:

- Cisco IOS Release 12.2(11)BC3 or a later BC release.
- The Cisco uBR7246VXR router supports FEC on Fast Ethernet channels with the Cisco NPE-225 or Cisco NPE-400 network processing engines.
- The Cisco uBR7246VXR router supports GEC on Gigabit Ethernet channels using the Cisco uBR7200-NPE-G1 network processing engine.

**Table 9-1 Supported Interfaces and Encapsulations for EtherChannel on the Cisco CMTS**

Cisco CMTS	Full Duplex Supported	Encapsulation Supported	Cisco IOS Release
Cisco uBR7246VXR	Fast Ethernet with the Cisco NPE-225 or Cisco NPE-400	IEEE 802.1Q	12.2(11)BC3
	GigabitEthernet with the Cisco uBR7200-NPE-G1	IEEE 802.1Q	12.2(9a)BC
Cisco uBR10012	Gigabit Ethernet with the PRE2 Module	IEEE 802.1Q	12.2(9a)BC

## Restrictions for EtherChannel on the Cisco CMTS

The following restrictions apply to both the Cisco uBR10012 and Cisco uBR7246VXR routers with Cisco IOS Release 12.2(9a)BC and earlier supported releases:

- EtherChannel on the Cisco CMTS is limited to Network Layer 3 functions, and does not support Data-Link Layer 2 EtherChannel functions as with certain other Cisco product platforms.
- The Port Aggregation Protocol (PAgP) is not supported on the Cisco CMTS as with other Cisco product platforms (such as the CatOS switch).
- Only the IEEE 802.1Q trunking protocol is supported on the Cisco CMTS. ATM trunking is not supported on the Cisco uBR10012 or Cisco uBR7246VXR routers as of this release.

## Information About EtherChannel on the Cisco CMTS

Several Cisco product platforms currently support EtherChannel, such as the Cisco 7200 Series and Cisco Catalyst Switches. This document describes EtherChannel on the following Cisco CMTS router platforms:

- [Introduction to EtherChannel on the Cisco CMTS, page 9-3](#)
- [Cisco FastEtherChannel \(FEC\) and GigabitEtherChannel \(GEC\) on the Cisco uBR7246VXR Router, page 9-4](#)
- [Cisco GigabitEtherChannel \(GEC\) on the Cisco uBR10012 Router, page 9-4](#)

## Introduction to EtherChannel on the Cisco CMTS

EtherChannel is based on proven industry-standard technology. The Cisco CMTS supports EtherChannel with several benefits, including the following:

- EtherChannel on the Cisco CMTS supports subsecond convergence times.
- EtherChannel can be used to connect two switch devices together, or to connect a router with a switch.
- A single EtherChannel connection supports a higher bandwidth between the two devices.
- The logical port channels on either Cisco CMTS platform provide fault-tolerant, high-speed links between routers, switches, and servers.
- EtherChannel offers redundancy and high availability on the Cisco CMTS. Failure of one connection causes a switch or router to use load balancing across the other connections in the EtherChannel.
- Load balancing on the Cisco CMTS supports dynamic link addition and removal without traffic interruption.
- EtherChannel supports inter-VLAN trunking. Trunking carries traffic from several VLANs over a point-to-point link between the two devices. The network provides inter-VLAN communication with trunking between the Cisco CMTS router and one or more switches. In a campus network, trunking is configured over an EtherChannel link to carry the multiple VLAN information over a high-bandwidth channel.

## Cisco FastEtherChannel (FEC) and GigabitEtherChannel (GEC) on the Cisco uBR7246VXR Router

Cisco's Fast EtherChannel (FEC) technology builds upon standards-based 802.3 full-duplex Fast Ethernet to provide a reliable high-speed solution for network managers who require higher bandwidth between servers, routers, and switches than single-link Ethernet technology can provide.

Fast EtherChannel provides bandwidth scalability within the network backbone by providing increments from 200 Mbps to 800 Mbps with multi-gigabit capacity available on an increasing number of platforms.

Fast EtherChannel technology solves the immediate problem of scaling bandwidth within the network backbone, and can be applied to support Gigabit EtherChannels.

Cisco IOS Release 12.2(11)BC3 introduced support for Cisco EtherChannel technology for the Cisco uBR7246VXR router, and support continues with Cisco IOS Release 12.2(9a)BC. FEC on the Cisco uBR7246VXR router includes the following EtherChannel capabilities:

- Supports a maximum of four physical ports to be combined into one logical FEC or GEC link.
- Supports bandwidth up to 800 Mbps FEC (Fast EtherChannel full duplex) on the Cisco uBR7246VXR router.
- Supports bandwidth up to 4 Gbps GEC (Gigabit EtherChannel—half-duplex) for a combined total of up to 8 Gbps (full-duplex) with the Cisco uBR7200-NPE-G1 processor.

The Cisco uBR7200-NPE-G1 processor includes three onboard Gigabit Ethernet interfaces. If you want to use these interfaces to replace the Fast Ethernet interfaces on the existing I/O controller, you will have to configure the new interfaces before they can be used to access the network. If you are also removing the existing I/O controller, you remove the configuration for its Fast Ethernet interfaces.

The Cisco uBR7200-NPE-G1 contains its own onboard I/O controller, which includes the boot flash memory and NVRAM memory. After you install the Cisco uBR7200-NPE-G1 in a chassis, you can no longer access the boot flash and NVRAM memory on the I/O controller. You must therefore copy the Cisco IOS software image and configuration file to the memory on the Cisco uBR7200-NPE-G1.

## Cisco GigabitEtherChannel (GEC) on the Cisco uBR10012 Router

Cisco GigabitEtherChannel (GEC) is high-performance Ethernet technology that provides gigabit-per-second transmission rates. It provides flexible, scalable bandwidth with resiliency and load sharing across links for switches, router interfaces, and servers.

Cisco IOS Release 12.2(9a)BC supports GigabitEtherChannel on the Cisco uBR10012 router with the following EtherChannel capabilities:

- Supports IEEE 802.1Q encapsulation for inter-VLAN networking.
- Supports a maximum of four physical Ethernet ports to be combined as one logical EtherChannel link.
- Supports bandwidth up to 4 Gbps GEC (Gigabit EtherChannel—half duplex) for a combined total of up to 8 Gbps (full duplex) on the Cisco uBR10012 router with PRE2 performance routing engine modules.

# How to Configure EtherChannel on the Cisco CMTS

Refer to the following procedures to configure EtherChannel on the Cisco CMTS:

- [Cisco FastEtherChannel \(FEC\) and GigabitEtherChannel \(GEC\) on the Cisco uBR7246VXR Router, page 9-4](#)
- [“Verifying EtherChannel on the Cisco CMTS” section on page 9-8](#)
- [“Configuration Examples for EtherChannel on the Cisco CMTS” section on page 9-8](#)

## Configuring FEC or GEC EtherChannel on the Cisco CMTS

This procedure describes and illustrates the configuration of EtherChannel FEC or GEC on the Cisco uBR7246VXR or Cisco uBR10012 routers, as described in [Table 9-1 on page 9-2](#).

### Prerequisites

- Cisco IOS 12.2(9a)BC is installed or upgraded on either the Cisco uBR10012 or Cisco uBR7246VXR universal broadband router.
- Fast Ethernet or Gigabit Ethernet modules and interfaces are installed on the Cisco uBR7246VXR chassis as described in the [“Cisco FastEtherChannel \(FEC\) and GigabitEtherChannel \(GEC\) on the Cisco uBR7246VXR Router” section on page 4](#).
- PRE2 modules are installed in the Cisco uBR10012 router chassis as described in the [“Cisco GigabitEtherChannel \(GEC\) on the Cisco uBR10012 Router” section on page 9-4](#).
- Fast Ethernet or Gigabit Ethernet cabling is completed and the ports are operational on the router and network.
- LAN interfaces are configured and operational on the router and network, with IP addresses and subnet masks.

### Restrictions

- The Cisco uBR7246VXR and Cisco uBR10012 routers support up to four physical connectors to be configured as one logical FEC or GEC port.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface port-channel** *number*
4. **exit**
5. **interface gigabitethernet** *slot/{subslot}/port*  
or
6. **interface fastethernet** *slot/(subslot)/port*
7. **shutdown**
8. **channel-group** *number*
9. **no shutdown**
10. **Ctrl-Z**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<pre>enable</pre> <p><b>Example:</b> Router&gt; enable </p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<pre>configure terminal</pre> <p><b>Example:</b> Router# configure terminal </p>	<p>Enters global configuration mode.</p>
Step 3	<pre>interface port-channel n</pre> <p><b>Example:</b> Router(config)# interface port-channel 1 </p>	<p>Creates an EtherChannel interface. The first EtherChannel interface configured becomes the bundle master for all ports in the EtherChannel group. The MAC address of the first EtherChannel interface is the MAC address for all EtherChannel interfaces in the group.</p> <ul style="list-style-type: none"> <li><i>n</i>—EtherChannel port number for the specified port. The EtherChannel port number may range from 1 to 64.</li> </ul> <p>To remove an EtherChannel interface from the EtherChannel group, use the <b>no</b> form of this command.</p> <p>For illustration, the example at left names the interface <b>Port-channel11</b>.</p> <p>If the first EtherChannel interface in the group is later removed, the second EtherChannel interface in the group becomes the bundle master by default.</p> <p>Repeat this step on every EtherChannel port to be bundled into a FEC or GEC group. This configuration must be present on all EtherChannel interfaces before the EtherChannel group can be configured.</p>
Step 4	<pre>exit</pre> <p><b>Example:</b> Router(config-if)# exit </p>	<p>Exits interface configuration mode for <b>Port-channel11</b> and returns to global configuration mode.</p>
Step 5	<pre>interface gigabitethernet slot/{subslot}/port</pre> <p><b>Example:</b> Router# interface gigabitethernet 1/0/0 </p>	<p>(Gigabit Ethernet interface only) Selects the Gigabit Ethernet interface that you wish to add as a member EtherChannel link in the EtherChannel bundle, and enters interface configuration mode.</p> <p>The Cisco CMTS Cisco uBR10012 and Cisco uBR7246VXR routers differ in slot selection as follows:</p> <ul style="list-style-type: none"> <li><i>slot/subslot/port</i>—Cisco uBR10012 router</li> <li><i>slot/port</i>—Cisco uBR7246VXR router</li> </ul> <p><b>Note</b> Cisco recommends that the link being added to the Cisco CMTS EtherChannel be shut down prior to configuring it as a member of the EtherChannel. Use the <b>shutdown</b> command in interface configuration mode immediately before completing the following steps in this procedure.</p>

	Command or Action	Purpose
Step 6	<pre>interface fastethernet slot/(subslot)port</pre> <p><b>Example:</b> Router# interface fastethernet 3/0</p>	<p>(Fast Ethernet interface only) Selects a Fast Ethernet interface and enters interface configuration mode.</p> <p><b>Note</b> The Cisco CMTS Cisco uBR10012 and Cisco uBR7246VXR routers differ in slot selection as follows:</p> <ul style="list-style-type: none"> <li>– <i>slot/subslot/port</i>—Cisco uBR10012 router</li> <li>– <i>slot/port</i>—Cisco uBR7246VXR router</li> </ul>
Step 7	<pre>shutdown</pre> <p><b>Example:</b> Router(config-if)# shutdown</p>	<p>Shuts down the interface selected in Step 5 or Step 6 above prior to configuring it as a member of the EtherChannel.</p> <p><b>Note</b> Cisco recommends that the link being added to the Cisco CMTS EtherChannel be shut down prior to configuring it as a member of the EtherChannel.</p>
Step 8	<pre>channel-group number</pre> <p><b>Example:</b> Router(config-if)# channel-group 1</p>	<p>Adds the current interface (Gigabit Ethernet or Fast Ethernet) to the EtherChannel Group, associating that interface with an EtherChannel link.</p> <ul style="list-style-type: none"> <li>• <i>number</i>—The identifying number for the EtherChannel group with which to associate this interface. An EtherChannel group can be identified in the range of 1 to 64, and each group can have up to four interfaces, only one of which is the master.</li> </ul> <p>To remove an EtherChannel group and the associated ports from the Cisco CMTS, use the <b>no</b> form of this command.</p>
Step 9	<pre>no shutdown</pre> <p><b>Example:</b></p>	<p>Enables the interface on which EtherChannel is configured.</p>
Step 10	<pre>Ctrl-z</pre> <p><b>Example:</b> Router(config)# Ctrl-z</p>	<p>Returns to privileged EXEC mode.</p> <p>IP traffic should be visible on the network with completion of the above steps.</p>

## Examples

See [Configuration Examples for EtherChannel on the Cisco CMTS](#), page 8.

## Troubleshooting Tips

Once interface operations are confirmed (prior to this procedure), and EtherChannel configurations have been verified (next procedure), any difficulty experienced through the EtherChannel links may pertain to inter-VLAN or IP routing on the network, or perhaps very high bandwidth consumption.

See the “[Additional References](#)” section on [page 10](#) for further resources in troubleshooting these and additional configurations.

## What to Do Next

Additional IP, access list, inter-VLAN or load balancing configurations may be made to the Cisco CMTS and these changes will be supported in the running EtherChannel configuration without service disruption from EtherChannel. Refer to the [“Additional References” section on page 11](#) for more information.

## Verifying EtherChannel on the Cisco CMTS

Links can be added or removed from an EtherChannel interface without traffic interruption. If an Ethernet link in an EtherChannel interface fails, traffic previously carried over the failed link switches to the remaining links within the EtherChannel. There are a number of events that can cause a link to be added or removed including adding or removing a link using Cisco IOS commands and simulating link failure and recovery (as with **(no)shutdown** links).

Cisco EtherChannel supports online insertion and removal (OIR) of field-replaceable units (FRUs) in the Cisco CMTS chassis. Ports that remain active during OIR of one FRU will take over and support the traffic bandwidth requirements without service disruption. However, OIR is not described in this procedure. Refer to the [“Additional References” section on page 10](#) for complete OIR procedures and guidelines for the respective FRU.

### SUMMARY STEPS

1. **enable**
2. **show interface port-channel *channel-id***

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
Step 2	<b>show interface port-channel <i>n</i></b>  <b>Example:</b> Router# show interface port-channel 1	Verifies the EtherChannel configuration on the Cisco CMTS for the selected EtherChannel group.  • <i>n</i> —The identifying number for the Port Channel group to display.

## Configuration Examples for EtherChannel on the Cisco CMTS

The sequential configuration example and commands in [Table 2](#) illustrate the configuration of Etherchannel on a Cisco uBR7246VXR router with a five-port sensor:

The following example illustrates Gigabit EtherChannel (GEC) information for the port-channel interface of 2 as configured on a Cisco uBR10012 router with the PRE2 performance routing engine model.

This configuration is comprised of three GEC port channels as follows:

- Member 0 is the GEC interface bundle master.
- Member 2 is the final slave interface in this GEC group.
- These three port-channel interfaces (members) comprise one GEC group that is set up with a GEC peer on the network.

```
Router# show interface port-channel 2
```

```

Port-channel2 is up, line protocol is up
Hardware is GEChannel, address is 8888.8888.8888 (bia 0000.0000.0000)
Internet address is 101.101.101.1/16
MTU 1500 bytes, BW 3000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 04:00:00
  No. of members in this channel: 3
  No. of configured members in this channel: 3
  No. of passive members in this channel: 0
  No. of active members in this channel: 3
    Member 0 : GigabitEthernet1/0/0 , Full-duplex, 1000Mb/s
    Member 1 : GigabitEthernet3/0/0 , Full-duplex, 1000Mb/s
    Member 2 : GigabitEthernet2/0/0 , Full-duplex, 1000Mb/s
  No. of Non-active members in this channel: 0
Last input 00:00:02, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/225/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/120 (size/max)
30 second input rate 17292000 bits/sec, 9948 packets/sec
30 second output rate 17315000 bits/sec, 9935 packets/sec
866398790 packets input, 3324942446 bytes, 0 no buffer
Received 2 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog, 0 multicast, 0 pause input
0 input packets with dribble condition detected
866394055 packets output, 3323914794 bytes, 0 underruns
0 output errors, 0 collisions, 0 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier, 0 pause output
0 output buffer failures, 0 output buffers swapped out

```

The following example illustrates GEC information for the port-channel interface of 2 as configured on a Cisco uBR7246VXR router.

This configuration is comprised of three port-channel interfaces (members) as follows:

- Member 0 is the GEC interface bundle master.
- Member 2 is the final slave interface in this GEC group.
- These three port-channel interfaces (members) comprise one GEC group that is set up with a GEC peer on the network.

```

Router# show interfaces port-channel 2
Port-channel2 is up, line protocol is up
Hardware is GEChannel, address is 000b.bf7d.9c01 (bia 000b.bf7d.9c00)
Internet address is 101.101.101.2/16
MTU 1500 bytes, BW 3000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 04:00:00
  No. of members in this channel: 3
  No. of configured members in this channel: 3
  No. of passive members in this channel: 0
  No. of active members in this channel: 3
    Member 0 : GigabitEthernet0/3 , Full-duplex, 1000Mb/s
    Member 1 : GigabitEthernet0/2 , Full-duplex, 1000Mb/s
    Member 2 : GigabitEthernet0/1 , Full-duplex, 1000Mb/s
  No. of Non-active members in this channel: 0
Last input 00:13:48, output never, output hang never
Last clearing of "show interface" counters never

```

```

Input queue: 0/225/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/120 (size/max)
30 second input rate 17358000 bits/sec, 9999 packets/sec
30 second output rate 17359000 bits/sec, 10000 packets/sec
 868633935 packets input, 3809968911 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
 0 watchdog, 0 multicast, 0 pause input
 0 input packets with dribble condition detected
868642883 packets output, 3811242413 bytes, 0 underruns
 2 output errors, 0 collisions, 0 interface resets
 0 babbles, 0 late collision, 0 deferred
 2 lost carrier, 0 no carrier, 0 pause output
 0 output buffer failures, 0 output buffers swapped out

```

The following example illustrates FastEtherChannel (FEC) information for the port channel interface of 1 as configured on a Cisco uBR7246VXR router.

This configuration is comprised of four port channel interfaces (members) as follows:

- Member 0
- Member 0 is the GEC interface bundle master.
- Member 3 is the final slave interface in this FEC group.
- These four port-channel interfaces (members) comprise one FEC group that is set up with an FEC peer on the network.

```

Router# show interfaces port-channel 1
Port-channel1 is up, line protocol is up
Hardware is FEChannel, address is 000b.bf7d.9c1c (bia 000b.bf7d.9c00)
Description: test
Internet address is 100.100.100.1/24
MTU 1500 bytes, BW 400000 Kbit, DLY 100 usec,
  reliability 255/255, txload 11/255, rxload 11/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 04:00:00
  No. of members in this channel: 4
  No. of configured members in this channel: 4
  No. of passive members in this channel: 0
  No. of active members in this channel: 4
    Member 0 : FastEthernet2/1 , Full-duplex, 100Mb/s
    Member 1 : FastEthernet2/0 , Full-duplex, 100Mb/s
    Member 2 : FastEthernet1/1 , Full-duplex, 100Mb/s
    Member 3 : FastEthernet1/0 , Full-duplex, 100Mb/s
  No. of Non-active members in this channel: 0
Last input 00:14:48, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/300/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/160 (size/max)
30 second input rate 17358000 bits/sec, 9998 packets/sec
30 second output rate 17357000 bits/sec, 9998 packets/sec
 869366601 packets input, 3968956491 bytes
Received 3 broadcasts, 0 runts, 0 giants, 0 throttles
 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
 0 watchdog
 0 input packets with dribble condition detected
868944538 packets output, 3876736548 bytes, 0 underruns
 0 output errors, 0 collisions, 0 interface resets
 0 babbles, 0 late collision, 0 deferred
 0 lost carrier, 0 no carrier

```

```
0 output buffer failures, 0 output buffers swapped out
```

# Additional References

The following additional references are available for Cisco Cable Modem Termination System Feature Guide.

## Related Documents

Related Topic	Document Title
EtherChannel for Cisco Products	<ul style="list-style-type: none"> <li>• <i>Cisco EtherChannel</i> home page <a href="http://www.cisco.com/en/US/tech/tk389/tk213/tsd_technology_support_protocol_home.html">http://www.cisco.com/en/US/tech/tk389/tk213/tsd_technology_support_protocol_home.html</a></li> <li>• <i>Cisco EtherChannel Technology</i> white paper <a href="http://www.cisco.com/en/US/tech/tk389/tk213/technologies_white_paper09186a0080092944.shtml">http://www.cisco.com/en/US/tech/tk389/tk213/technologies_white_paper09186a0080092944.shtml</a></li> <li>• <i>Fast EtherChannel</i> web page <a href="http://www.cisco.com/en/US/tech/tk389/tk213/tk225/tsd_technology_support_sub-protocol_home.html">http://www.cisco.com/en/US/tech/tk389/tk213/tk225/tsd_technology_support_sub-protocol_home.html</a></li> <li>• <i>Gigabit EtherChannel</i> web page <a href="http://www.cisco.com/en/US/tech/tk389/tk213/tk276/tsd_technology_support_sub-protocol_home.html">http://www.cisco.com/en/US/tech/tk389/tk213/tk276/tsd_technology_support_sub-protocol_home.html</a></li> </ul>
Cisco uBR10012 Universal Broadband Router	<ul style="list-style-type: none"> <li>• <i>Cisco uBR10012 Universal Broadband Router Hardware Installation Guide</i> <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/guide/hig.html">http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/guide/hig.html</a></li> <li>• <i>Cisco uBR10012 Universal Broadband Router Performance Routing Engine Module</i> <a href="http://www.cisco.com/en/US/docs/interfaces_modules/cable/performance_routing_engine/installation/guide/pre5096.html">http://www.cisco.com/en/US/docs/interfaces_modules/cable/performance_routing_engine/installation/guide/pre5096.html</a></li> <li>• <i>Cisco uBR10012 OC-48 DPT/POS Interface Module (Installation and Configuration)</i> <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/field_replaceable_units/ub_oc48.html">http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/field_replaceable_units/ub_oc48.html</a> <a href="http://www.cisco.com/en/US/docs/interfaces_modules/cable/line_cards/ubr_oc48_dpt_pos/configuration/guide/oc48pre2.html">http://www.cisco.com/en/US/docs/interfaces_modules/cable/line_cards/ubr_oc48_dpt_pos/configuration/guide/oc48pre2.html</a></li> </ul>
Cisco uBR7246VXR Universal Broadband Router	<ul style="list-style-type: none"> <li>• <i>Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide</i> <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr7200/installation/guide/ub72khig.html">http://www.cisco.com/en/US/docs/cable/cmts/ubr7200/installation/guide/ub72khig.html</a></li> <li>• <i>Cisco uBR7200-NPE-G1 Network Processing Engine (Read Me First and White Paper)</i> <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/field_replaceable_units/ub_oc48.html">http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/field_replaceable_units/ub_oc48.html</a> <a href="http://www.cisco.com/en/US/products/hw/modules/ps4917/products_white_paper09186a080113728.shtml">http://www.cisco.com/en/US/products/hw/modules/ps4917/products_white_paper09186a080113728.shtml</a></li> </ul>

Related Topic	Document Title
WAN and Inter-VLAN Routing with the Cisco CMTS	<ul style="list-style-type: none"> <li data-bbox="457 264 1474 401">• “<i>Configuring LAN Interfaces</i>” chapter in the <i>Cisco IOS Interface Configuration Guide</i>, Release 12.2 <a href="http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/finter_c/icflanin.htm">http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/finter_c/icflanin.htm</a></li> <li data-bbox="457 422 1523 600">• <i>Transparent LAN Service (TLS) over Cable</i> Describes how to map a service ID (SID) to an ATM permanent virtual connection (PVC) or to an IEEE 802.1Q VLAN. <a href="http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122newft/122limit/122bc/122bc_11/sidatmpv.htm">http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122newft/122limit/122bc/122bc_11/sidatmpv.htm</a></li> <li data-bbox="457 621 1268 648">• <i>Cisco IOS Wide-Area Networking Configuration Guide</i>, Release 12.3</li> </ul> <p data-bbox="448 663 1435 753"><b>Note</b> This document has reached End of Life. For more information, see the following End-of-Life Announcement at the following URL: <a href="http://www.cisco.com/en/US/docs/ios/redirect/eol.html">http://www.cisco.com/en/US/docs/ios/redirect/eol.html</a></p> <ul style="list-style-type: none"> <li data-bbox="457 789 1511 890">• <i>Point-to-Point Protocol over Ethernet Support on the Cisco CMTS</i> <a href="http://www.cisco.com/en/US/docs/ios/cable/configuration/guide/cmts_ppp_ov_enet_ps2209_TSD_Products_Configuration_Guide_Chapter.html">http://www.cisco.com/en/US/docs/ios/cable/configuration/guide/cmts_ppp_ov_enet_ps2209_TSD_Products_Configuration_Guide_Chapter.html</a></li> <li data-bbox="457 911 862 938">• <i>Cisco IOS IEEE 802.1Q Support</i></li> </ul> <p data-bbox="448 953 1435 1043"><b>Note</b> This document has reached End of Life. For more information, see the following End-of-Life Announcement at the following URL: <a href="http://www.cisco.com/en/US/docs/ios/redirect/eol.html">http://www.cisco.com/en/US/docs/ios/redirect/eol.html</a></p> <ul style="list-style-type: none"> <li data-bbox="457 1079 1203 1106">• <i>ATM Multilink PPP Support on Multiple Virtual Circuits (VCs)</i></li> </ul> <p data-bbox="448 1121 1435 1211"><b>Note</b> This document has reached End of Life. For more information, see the following End-of-Life Announcement at the following URL: <a href="http://www.cisco.com/en/US/docs/ios/redirect/eol.html">http://www.cisco.com/en/US/docs/ios/redirect/eol.html</a></p> <ul style="list-style-type: none"> <li data-bbox="457 1247 1013 1274">• <i>Cisco New Virtual Circuit (VC) Configuration</i></li> </ul> <p data-bbox="448 1289 1435 1379"><b>Note</b> This document has reached End of Life. For more information, see the following End-of-Life Announcement at the following URL: <a href="http://www.cisco.com/en/US/docs/ios/redirect/eol.html">http://www.cisco.com/en/US/docs/ios/redirect/eol.html</a></p> <ul style="list-style-type: none"> <li data-bbox="457 1415 1036 1442">• <i>Cisco IOS IP Configuration Guide</i>, Release 12.3</li> </ul> <p data-bbox="448 1457 1435 1547"><b>Note</b> This document has reached End of Life. For more information, see the following End-of-Life Announcement at the following URL: <a href="http://www.cisco.com/en/US/docs/ios/redirect/eol.html">http://www.cisco.com/en/US/docs/ios/redirect/eol.html</a></p>
Configuring Additional Devices for EtherChannel	<ul style="list-style-type: none"> <li data-bbox="457 1560 1507 1696">• <i>Configuring EtherChannel and 802.1Q Trunking Between a Catalyst 2950 and a Router (inter-VLAN Routing)</i> <a href="http://www.cisco.com/en/US/products/hw/switches/ps628/products_configuration_example09186a00800ef797.shtml">http://www.cisco.com/en/US/products/hw/switches/ps628/products_configuration_example09186a00800ef797.shtml</a></li> <li data-bbox="457 1717 1507 1854">• <i>Configuring EtherChannel and 802.1Q Trunking Between Catalyst 2900XL/3500XL and Catalyst 2940, 2950/2955, and 2970 Switches</i> <a href="http://www.cisco.com/en/US/products/hw/switches/ps607/products_configuration_example09186a0080094789.shtml">http://www.cisco.com/en/US/products/hw/switches/ps607/products_configuration_example09186a0080094789.shtml</a></li> </ul>

## Standards

Standards	Title
IEEE Std 802.1Q, 2003 Edition	<ul style="list-style-type: none"> <li>IEEE Std 802.1Q, 2003 Edition (Incorporates IEEE Std 802.1Q-1998, IEEE Std 802.1u-2001, IEEE Std 802.1v-2001, and IEEE Std 802.1s-2002)  <a href="http://ieeexplore.ieee.org/xpl/tocresult.jsp?isNumber=27089">http://ieeexplore.ieee.org/xpl/tocresult.jsp?isNumber=27089</a></li> </ul>

## MIBs

For additional information about MIBs for the Cisco CMTS, refer to the following resources on Cisco.com:

- Cisco CMTS Universal Broadband Router MIB Specifications Guide*  
<http://www.cisco.com/en/US/docs/cable/cmts/mib/reference/guide/mibv5ubr.html>
- SNMP Object Navigator*  
<http://tools.cisco.com/Support/SNMP/do/BrowseOID.do?local=en>

## Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

# Command Reference for EtherChannel on the Cisco CMTS

This section describes the following Cisco IOS Software commands for Cisco IOS Release 12.2(9a)BC, as supported by the Cisco uBR10012 router or the Cisco uBR7246VXR routers:

- [channel-group](#)
- [interface port-channel](#)
- [show interface port-channel](#)

# channel-group

To add an interface (Gigabit Ethernet or Fast Ethernet) to an EtherChannel Group, and to associate that interface with an EtherChannel link, use the **channel-group** command in interface configuration mode.

To remove an EtherChannel interface from the EtherChannel group, use the **no** form of this command.

**channel-group** *n*

**no channel-group** *n*

## Syntax Description

<i>n</i>	The identifying number for the EtherChannel group with which to associate this interface. An EtherChannel group can be identified in the range of 1 to 64, and each group can have up to four interfaces, only one of which is the master.
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## Defaults

By default, the **channel-group** command has the following behaviors:

- EtherChannel groups and ports are not defined.
- EtherChannel groups and ports are disabled (**off** mode) once configured, and must be enabled.
- The first port assigned to an EtherChannel group is the bundle master.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(11)BC3	This command was introduced on the Cisco uBR7246VXR router.
12.2(9a)BC	This command was introduced on the Cisco uBR10012 router.

## Usage Guidelines

The **no** form of this command also removes the associated EtherChannel ports within the EtherChannel group.

## Examples

The following example creates an EtherChannel link with a channel group identifier of 1 on the specified port. If this is the first port assigned to EtherChannel group 1, it becomes the master in that EtherChannel group.

```
Router(config-if)# channel-group etherchannel 1
```

## Related Commands

Command	Description
<a href="#">show interface port-channel</a>	Displays the EtherChannel interfaces and channel identifiers, with their mode and operational status.

# interface port-channel

To create an EtherChannel interface on the Cisco Cable Modem Termination System (CMTS), use the **interface port-channel** command in global configuration mode. To remove this EtherChannel port from the Cisco CMTS, use the **no** form of this command.

```
interface port-channel n
no interface port-channel n
```

## Syntax Description

<i>number</i>	Identifying port channel number for this interface (EtherChannel port). The range is 1 to 64.
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## Defaults

By default, EtherChannel groups and ports are not defined, and they are disabled (**off** mode) configured.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(11)BC3	This command was introduced on the Cisco uBR7246VXR router.
12.2(9a)BC	This command was introduced on the Cisco uBR10012 router.

## Usage Guidelines

The first EtherChannel interface configured becomes the bundle master for all EtherChannel interfaces in the group. That is, the MAC address of the first EtherChannel interface is the MAC address for all EtherChannel interfaces in the group. If the first EtherChannel interface is later removed, the second EtherChannel interface to be configured becomes the bundled master by default.

Repeat this configuration on every EtherChannel port to be bundled into a FastEtherChannel (FEC) or GigabitEtherChannel (GEC) group. This configuration must be present on all EtherChannel interfaces before the EtherChannel group can be configured.

## Examples

The following example configures the port to have an EtherChannel port number of 1 within its EtherChannel group. The EtherChannel group is defined with the **channel-group** command.

```
Router(config-if)# interface port-channel 1
```

## Related Commands

Command	Description
<b>channel-group</b>	Assigns an EtherChannel port to an EtherChannel group.
<b>show interface port-channel</b>	Displays the EtherChannel interfaces and channel identifiers, with their mode and operational status.

# show interface port-channel

To display the EtherChannel interfaces and channel identifiers, with their mode and operational status, use the **show interface port-channel** command in privileged EXEC mode.

```
show interface port-channel {number}
```

<b>Syntax Description</b>	<i>number</i>	Optional value enables the display of information for one port channel interface number. The range is from 1 to 64.
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**Defaults** No default behaviors or values.

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(11)BC3	This command was introduced on the Cisco uBR7246VXR router.
	12.2(9a)BC	This command was introduced on the Cisco uBR10012 router.

## Examples

The following example illustrates Gigabit EtherChannel (GEC) information for the port-channel interface of 2 as configured on a Cisco uBR10012 router with the PRE2 performance routing engine model.

This configuration is comprised of three GEC port channels as follows:

- Member 0 is the GEC interface bundle master.
- Member 2 is the final slave interface in this GEC group.
- These three port-channel interfaces (members) comprise one GEC group that is set up with a GEC peer on the network.

```
Router# show interface port-channel 2
Port-channel2 is up, line protocol is up
  Hardware is GEChannel, address is 8888.8888.8888 (bia 0000.0000.0000)
  Internet address is 101.101.101.1/16
  MTU 1500 bytes, BW 3000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  No. of members in this channel: 3
  No. of configured members in this channel: 3
  No. of passive members in this channel: 0
  No. of active members in this channel: 3
    Member 0 : GigabitEthernet1/0/0 , Full-duplex, 1000Mb/s
    Member 1 : GigabitEthernet3/0/0 , Full-duplex, 1000Mb/s
    Member 2 : GigabitEthernet2/0/0 , Full-duplex, 1000Mb/s
  No. of Non-active members in this channel: 0
  Last input 00:00:02, output never, output hang never
  Last clearing of "show interface" counters never
```

```

Input queue: 0/225/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/120 (size/max)
30 second input rate 17292000 bits/sec, 9948 packets/sec
30 second output rate 17315000 bits/sec, 9935 packets/sec
866398790 packets input, 3324942446 bytes, 0 no buffer
Received 2 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog, 0 multicast, 0 pause input
0 input packets with dribble condition detected
866394055 packets output, 3323914794 bytes, 0 underruns
0 output errors, 0 collisions, 0 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier, 0 pause output
0 output buffer failures, 0 output buffers swapped out

```

The following example illustrates GEC information for the port-channel interface of 2 as configured on a Cisco uBR7246VXR router.

This configuration is comprised of three port-channel interfaces (members) as follows:

- Member 0 is the GEC interface bundle master.
- Member 2 is the final slave interface in this GEC group.
- These three port-channel interfaces (members) comprise one GEC group that is set up with a GEC peer on the network.

```

Router# show interfaces port-channel 2
Port-channel2 is up, line protocol is up
Hardware is GEChannel, address is 000b.bf7d.9c01 (bia 000b.bf7d.9c00)
Internet address is 101.101.101.2/16
MTU 1500 bytes, BW 3000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
ARP type: ARPA, ARP Timeout 04:00:00
No. of members in this channel: 3
No. of configured members in this channel: 3
No. of passive members in this channel: 0
No. of active members in this channel: 3
    Member 0 : GigabitEthernet0/3 , Full-duplex, 1000Mb/s
    Member 1 : GigabitEthernet0/2 , Full-duplex, 1000Mb/s
    Member 2 : GigabitEthernet0/1 , Full-duplex, 1000Mb/s
No. of Non-active members in this channel: 0
Last input 00:13:48, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/225/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/120 (size/max)
30 second input rate 17358000 bits/sec, 9999 packets/sec
30 second output rate 17359000 bits/sec, 10000 packets/sec
868633935 packets input, 3809968911 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog, 0 multicast, 0 pause input
0 input packets with dribble condition detected
868642883 packets output, 3811242413 bytes, 0 underruns
2 output errors, 0 collisions, 0 interface resets
0 babbles, 0 late collision, 0 deferred
2 lost carrier, 0 no carrier, 0 pause output
0 output buffer failures, 0 output buffers swapped out

```

The following example illustrates FastEtherChannel (FEC) information for the specified port channel interface as configured on a Cisco uBR7246VXR router.

This configuration is comprised of four port channel interfaces (members) as follows:

- Member 0
- Member 0 is the GEC interface bundle master.
- Member 3 is the final slave interface in this FEC group.
- These four port-channel interfaces (members) comprise one FEC group that is set up with an FEC peer on the network.

```
Router# show interfaces port-channel 1
Port-channel1 is up, line protocol is up
  Hardware is FEChannel, address is 000b.bf7d.9c1c (bia 000b.bf7d.9c00)
  Description: test
  Internet address is 100.100.100.1/24
  MTU 1500 bytes, BW 400000 Kbit, DLY 100 usec,
    reliability 255/255, txload 11/255, rxload 11/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
    No. of members in this channel: 4
    No. of configured members in this channel: 4
    No. of passive members in this channel: 0
    No. of active members in this channel: 4
      Member 0 : FastEthernet2/1 , Full-duplex, 100Mb/s
      Member 1 : FastEthernet2/0 , Full-duplex, 100Mb/s
      Member 2 : FastEthernet1/1 , Full-duplex, 100Mb/s
      Member 3 : FastEthernet1/0 , Full-duplex, 100Mb/s
    No. of Non-active members in this channel: 0
  Last input 00:14:48, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/300/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/160 (size/max)
  30 second input rate 17358000 bits/sec, 9998 packets/sec
  30 second output rate 17357000 bits/sec, 9998 packets/sec
    869366601 packets input, 3968956491 bytes
    Received 3 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog
    0 input packets with dribble condition detected
    868944538 packets output, 3876736548 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
```

## Related Commands

Command	Description
<a href="#">channel-group</a>	Creates an EtherChannel group and link, through which all port-channel interfaces interoperate with the network.
<a href="#">interface port-channel</a>	Creates an EtherChannel interface on the Cisco CMTS.