EtherChannel for the Cisco CMTS

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 primary by default, and each subsidiary interface interacts with the network using the MAC address of the EtherChannel bundle primary.

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 Ten Gigabit EtherChannel (GEC) on the Cisco cBR series routers.

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://tools.cisco.com/ITDIT/CFN/. An account on http://www.cisco.com/ is not required.

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Hardware Compatibility Matrix for the Cisco cBR Series Routers

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

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

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-SUP-250G • PID—CBR-CCAP-SUP-160G	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 CCAP Line Cards: • PID—CBR-LC-8D30-16U30 • PID—CBR-LC-8D31-16U30 • PID—CBR-RF-PIC • PID—CBR-RF-PROT-PIC • PID—CBR-CCAP-LC-40G • PID—CBR-CCAP-LC-40G-R • PID—CBR-CCAP-LC-G2-R • PID—CBR-SUP-8X10G-PIC • PID—CBR-2X100G-PIC Digital PICs: • PID—CBR-DPIC-8X10G • PID—CBR-DPIC-2X100G Cisco cBR-8 Downstream PHY Module: • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D31-US-MOD

Restrictions for EtherChannel on the Cisco CMTS

- 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 cBR series routers.
- The maximum supported links per bundle is 8.
- EtherChannel on Cisco CMTS supports only physical ports or interfaces that have the same speed.
- EtherChannel on the Cisco cBR series routers does not support MQC QOS. You can use Equal Cost Multi Path (ECMP) load balancing instead of EtherChannel.
- Layer 3 configurations on member interfaces of EtherChannel are not supported.
- MAC Address Accounting feature on port channel is not supported.

Information About EtherChannel on the Cisco CMTS

This section contains the following:

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 Ten Gigabit EtherChannel on the Cisco cBR Series Routers

Cisco Ten Gigabit EtherChannel (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.

Ten GEC on the Cisco cBR series routers with the following EtherChannel capabilities:

- Supports IEEE 802.1Q encapsulation for inter-VLAN networking.
- Supports a maximum of eight physical Ten Gigabit Ethernet ports to be combined as one logical EtherChannel link.
- Supports bandwidth up to 40 Gbps (half duplex) for a combined total of up to 80 Gbps (full duplex).

How to Configure EtherChannel on the Cisco CMTS

This section contains the following:

Configuring Ten Gigabit EtherChannel on the Cisco CMTS

Before you begin

- Ten 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.

Note The Cisco cBR series routers support up to eight physical connectors to be configured as one logical Ten GEC port.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface port-channel** *n*
4. **exit**
5. **interface tengigabitethernet** *slot/subslot/port*
6. **shutdown**
7. Use one of the following commands:
    - For static Ten GEC configuration, use the **channel-group** *number* command.
    - For dynamic Ten GEC configuration, use the **channel-group** *number* **mode** {**active** | **passive**} command.
8. **no shutdown**
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> **enable**	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	**Purpose**
Step 2	**configure terminal** **Example:** Router# **configure terminal**	Enters global configuration mode.
Step 3	**interface port-channel** *n* **Example:** Router(config)# **interface port-channel 1**	Creates an EtherChannel interface. The first EtherChannel interface configured becomes the bundle primary 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. To remove an EtherChannel interface from the EtherChannel group, use the **no** form of this command. If the first EtherChannel interface in the group is later removed, the second EtherChannel interface in the group becomes the bundle primary by default. Repeat this step on every EtherChannel port to be bundled into a Ten GEC group. This configuration must be present on all EtherChannel interfaces before the EtherChannel group can be configured.
Step 4	**exit** **Example:** Router(config-if)# **exit**	Exits interface configuration mode and returns to global configuration mode.
Step 5	**interface tengigabitethernet** *slot/subslot/port* **Example:** Router# **interface gigabitethernet 4/1/0**	Selects the Ten Gigabit Ethernet interface that you wish to add as a member EtherChannel link in the EtherChannel bundle, and enters interface configuration mode. **Note** We recommend 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 **shutdown** command in interface configuration mode immediately before completing the following steps in this procedure.
Step 6	**shutdown** **Example:** Router(config-if)# **shutdown**	Shuts down the interface selected in step 5 before configuring it as a member of the EtherChannel.
Step 7	Use one of the following commands: • For static Ten GEC configuration, use the **channel-group** *number* command.	Adds the Ten Gigabit Ethernet interface to the EtherChannel Group, associating that interface with an EtherChannel link. To remove an EtherChannel group and the associated ports from the Cisco CMTS, use the **no** form of this command.

Command or Action	Purpose

• For dynamic Ten GEC configuration, use the **channel-group** *number* **mode** {**active** | **passive**} command.
 	
Example:
 	
`Router(config-if)# channel-group 1`
 	
`or`
 	
`Router(config-if)# channel-group 1 mode active`	

Step 8 **no shutdown** **Example:** `Router(config-if)# no shutdown`	Enables the interface on which EtherChannel is configured.
Step 9 **end** **Example:** `Router(config# end`	Returns to privileged EXEC mode. IP traffic should be visible on the network with completion of the above steps.

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.

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.

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 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.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> **enable**	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show interface port-channel** *n* **Example:** Router# **show interface port-channel 1**	Verifies the EtherChannel configuration on the Cisco CMTS for the selected EtherChannel group.

Configuration Examples for EtherChannel on the Cisco CMTS

The following example illustrates Ten Gigabit EtherChannel information for the port-channel interface of 2.

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

  • Member 0 is the Ten GEC interface bundle primary.

  • Member 2 is the final subsidiary interface in this Ten GEC group.

  • These three port-channel interfaces (members) comprise one Ten GEC group that is set up with a Ten 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 : TenGigabitEthernet4/1/0 , Full-duplex, 1000Mb/s
        Member 1 : TenGigabitEthernet4/1/1 , Full-duplex, 1000Mb/s
        Member 2 : TenGigabitEthernet4/1/2 , 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
```

Additional References

Related Documents

Related Topic	Document Title
EtherChannel for Cisco Products	• Cisco EtherChannel home page http://www.cisco.com/warp/public/cc/techno/lnty/etty/fsetch/index.shtml • Cisco EtherChannel Technology white paper http://www.cisco.com/en/US/tech/tk389/tk213/technologies_white_paper09186a0080092944.shtml
Configuring Additional Devices for EtherChannel	• *Configuring EtherChannel and 802.1Q Trunking Between a Catalyst 2950 and a Router (inter-VLAN Routing)* http://www.cisco.com/c/en/us/support/docs/switches/catalyst-2950-series-switches/24042-158.html • *Configuring EtherChannel and 802.1Q Trunking Between Catalyst 2900XL/3500XL and Catalyst 2940, 2950/2955, and 2970 Switches* http://www.cisco.com/c/en/us/support/docs/switches/catalyst-2900-xl-series-switches/21041-131.html

Standards and RFCs

Standards	Title
IEEE Std 802.1Q, 2003 Edition	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) http://ieeexplore.ieee.org/xpl/tocresult.jsp?isNumber=27089

Technical Assistance

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

Feature Information for EtherChannel on Cisco CMTS

Use Cisco Feature Navigator to find information about the platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to the https://cfnng.cisco.com/ link. An account on the Cisco.com page is not required.

Note The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 2: Feature Information for EtherChannel on Cisco CMTS

Feature Name	Releases	Feature Information
EtherChannel on Cisco CMTS	Cisco IOS XE Everest 16.6.1	This feature was integrated into Cisco IOS XE Everest 16.6.1 on the Cisco cBR Series Converged Broadband Router.