



Configuring Ethernet Interfaces on Cisco IOS XR Software

This module describes the configuration of Ethernet interfaces on routers supporting Cisco IOS XR Software.

The distributed Gigabit Ethernet and 10 Gigabit Ethernet architecture and features deliver network scalability and performance, while enabling service providers to offer high-density, high-bandwidth networking solutions designed to interconnect the router with other systems in POPs, including core and edge routers and Layer 2 and 3 switches.

Feature History for Configuring Ethernet Interfaces on Cisco IOS XR Software

Release	Modification
Release 3.0	This feature was introduced on the Cisco CRS-1.
Release 3.2	Support was added for the Cisco XR 12000 Series Router.

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Prerequisites for Configuring Ethernet Interfaces

Before configuring Ethernet interfaces, be sure that the following tasks and conditions are met:

- To use the **show controllers** command, you must be in a user group associated with a task group that includes the proper task IDs for interface commands.
Task IDs for commands are listed in the *Cisco IOS XR Task ID Reference Guide*.
- For the Cisco CRS-1 router, confirm that at least one of the following cards is installed on the router:
 - an 8-port 10-Gigabit Ethernet (8 x 10 GE) PLIM per modular services card
 - an 8-port 1-Gigabit Ethernet SPA
- For GSR, confirm that at least one of the following cards is installed on the router:
 - a 4-port 1-Gigabit Ethernet PLIM.
 - a 5-port 1-Gigabit Ethernet SPA
 - 10-port 1-Gigabit Ethernet SPA
 - 1-port 10-Gigabit Ethernet SPA
- Know the interface IP address.
- You know how to apply the specify the generalized interface name with the generalized notation *rack/slot/module/port*.

Information About Configuring Ethernet Interfaces

To configure 10-Gigabit Ethernet interfaces, you need to understand the following concepts:

- [Ethernet Technology Overview, page HC-56](#)
- [Default Configuration Values for 10-Gigabit Ethernet, page HC-57](#)
- [Gigabit Ethernet Protocol Standards Overview, page HC-57](#)
- [MAC Accounting, page HC-58](#)
- [Ethernet MTU, page HC-58](#)
- [Flow Control on Ethernet Interfaces, page HC-59](#)
- [MAC Address, page HC-59](#)
- [802.1Q VLAN, page HC-59](#)
- [VRRP, page HC-59](#)
- [HSRP, page HC-59](#)

Ethernet Technology Overview

Ethernet was developed in the mid-1970s as a 10-Mbps networking protocol operating over a heavy coax cable.

Today, although many networks have migrated to Fast Ethernet (100 Mbps), Gigabit Ethernet (1000 Mbps), and 10-Gigabit Ethernet (10 Gbps), 10-Mbps Ethernet is still in widespread use and forms the basis of most networks.

Ethernet is defined by the IEEE 802.3 international standard. It enables the connection of up to 1024 nodes over coax, twisted-pair, or fiber-optic cable.

Default Configuration Values for 10-Gigabit Ethernet

Table 4 describes the default interface configuration parameters that are present when an interface is enabled on the 10-Gigabit Ethernet modular services card and its associated PLIM.



Note

You must specifically configure the **shutdown** command to bring an interface administratively down. The interface default is **no shutdown**. When a modular services card is first inserted into the router, if there is no established preconfiguration for it, the configuration manager adds a shutdown item to its configuration. This shutdown can be removed only by entering the **no shutdown** command.

Table 4 10-Gigabit Ethernet modular services card Default Configuration Values

Parameter	Configuration File Entry	Default Value
MAC accounting	mac-accounting	off
Flow control	flow-control egress	egress on ingress off
MTU	mtu	1514 for normal interfaces, 1518 for 802.1Q VLAN
MAC address	mac address	Hardware burned in address (BIA ¹)

1. burned in address

Gigabit Ethernet Protocol Standards Overview

The Gigabit Ethernet interfaces support the following protocol standards:

- [IEEE 802.3ab 1000BASE-T Gigabit Ethernet](#)
- [IEEE 802.3z 1000 Mbps Gigabit Ethernet](#)
- [IEEE 802.3ae 10 Gbps Ethernet](#)

These standards are further described in the sections that follow.

IEEE 802.3ab 1000BASE-T Gigabit Ethernet

The IEEE 802.3ab protocol standards, or Gigabit Ethernet over copper (also known as 1000BaseT) is an extension of the existing Fast Ethernet standard. It specifies Gigabit Ethernet operation over the Category 5e/6 cabling systems already installed, making it a highly cost-effective solution. As a result, most copper-based environments that run Fast Ethernet can also run Gigabit Ethernet over the existing network infrastructure to dramatically boost network performance for demanding applications.

IEEE 802.3z 1000 Mbps Gigabit Ethernet

Gigabit Ethernet builds on top of the Ethernet protocol, but increases speed tenfold over Fast Ethernet to 1000 Mbps, or 1 Gbps. Gigabit Ethernet allows Ethernet to scale from 10 or 100 Mbps at the desktop to 100 Mbps up to 1000 Mbps in the data center. Gigabit Ethernet conforms to the IEEE 802.3z protocol standard.

By leveraging the current Ethernet standard and the installed base of Ethernet and Fast Ethernet switches and routers, network managers do not need to retrain and relearn a new technology in order to provide support for Gigabit Ethernet.

IEEE 802.3ae 10 Gbps Ethernet

Under the International Standards Organization's Open Systems Interconnection (OSI) model, Ethernet is fundamentally a Layer 2 protocol. 10-Gigabit Ethernet uses the IEEE 802.3 Ethernet MAC protocol, the IEEE 802.3 Ethernet frame format, and the minimum and maximum IEEE 802.3 frame size. 10 Gbps Ethernet conforms to the IEEE 802.3ae protocol standards.

Just as 1000BASE-X and 1000BASE-T (Gigabit Ethernet) remained true to the Ethernet model, 10-Gigabit Ethernet continues the natural evolution of Ethernet in speed and distance. Because it is a full-duplex only and fiber-only technology, it does not need the carrier-sensing multiple-access with collision detection (CSMA/CD) protocol that defines slower, half-duplex Ethernet technologies. In every other respect, 10-Gigabit Ethernet remains true to the original Ethernet model.

MAC Accounting

The MAC address accounting feature provides accounting information for IP traffic based on the source and destination MAC addresses on LAN interfaces. This feature calculates the total packet and byte counts for a LAN interface that receives or sends IP packets to or from a unique MAC address. It also records a time stamp for the last packet received or sent.

Ethernet MTU

The Ethernet MTU is the size of the largest frame, minus the 4-byte frame check sequence (FCS), that can be transmitted on the Ethernet network. Every physical network along the destination of a packet can have a different MTU.

Cisco IOS XR supports two types of frame forwarding processes:

- Fragmentation for IPV4 packets— In this process, IPV4 packets are fragmented as necessary to fit within the MTU of the next-hop physical network.
- MTU discovery process determines largest packet size—This process is available for all IPV6 devices, and for originating IPV4 devices. In this process, the originating IP device determines the size of the largest IPV6 or IPV4 packet that can be sent without being fragmented. The largest packet is equal to the smallest MTU of any network between the IP source and the IP destination devices. If a packet is larger than the smallest MTU of all the networks in its path, that packet will be fragmented as necessary. This process ensures that the originating device does not send a too-large IP packet.

Jumbo frame support is automatically enable for frames that exceed the standard frame size. The default value is 1514 for standard frames and 1518 for 802.1Q tagged frames. These numbers exclude the 4-byte frame check sequence (FCS).

**Note**

IPv6 does not support fragmentation.

Flow Control on Ethernet Interfaces

The flow control used on 10-Gigabit Ethernet interfaces consists of periodically sending flow control pause frames. It is fundamentally different from the usual full- and half-duplex flow control used on standard management interfaces. Flow control can be activated or deactivated for ingress traffic only. It is automatically implemented for egress traffic.

MAC Address

A MAC address is a unique 6 byte address that identifies the interface at Layer 2.

802.1Q VLAN

A VLAN is a group of devices on one or more LANs that are configured so that they can communicate as if they were attached to the same wire, when in fact they are located on a number of different LAN segments. Because VLANs are based on logical instead of physical connections, it is very flexible for user and host management, bandwidth allocation, and resource optimization.

The IEEE's 802.1Q protocol standard addresses the problem of breaking large networks into smaller parts so broadcast and multicast traffic does not consume more bandwidth than necessary. The standard also helps provide a higher level of security between segments of internal networks.

The 802.1Q specification establishes a standard method for inserting VLAN membership information into Ethernet frames.

VRRP

The Virtual Router Redundancy Protocol (VRRP) eliminates the single point of failure inherent in the static default routed environment. VRRP specifies an election protocol that dynamically assigns responsibility for a virtual router to one of the VPN concentrators on a LAN. The VRRP VPN concentrator controlling the IP addresses associated with a virtual router is called the Master, and forwards packets sent to those IP addresses. When the master becomes unavailable, a backup VPN concentrator takes the place of the master.

For more information on VRRP, see the *Implementing VRRP on Cisco IOS XR Software* module of the *Cisco IOS XR IP Addresses and Services Configuration Guide*.

HSRP

Hot Standby Routing Protocol (HSRP) is a proprietary protocol from Cisco. HSRP is a routing protocol that provides backup to a router in the event of failure. Several routers are connected to the same segment of an Ethernet, FDDI, or token-ring network and work together to present the appearance of a single virtual router on the LAN. The routers share the same IP and MAC addresses and therefore, in the event

of failure of one router, the hosts on the LAN are able to continue forwarding packets to a consistent IP and MAC address. The transfer of routing responsibilities from one device to another is transparent to the user.

HSRP is designed to support non disruptive failover of IP traffic in certain circumstances and to allow hosts to appear to use a single router and to maintain connectivity even if the actual first hop router they are using fails. In other words, HSRP protects against the failure of the first hop router when the source host cannot learn the IP address of the first hop router dynamically. Multiple routers participate in HSRP and in concert create the illusion of a single virtual router. HSRP ensures that one and only one of the routers is forwarding packets on behalf of the virtual router. End hosts forward their packets to the virtual router.

The router forwarding packets is known as the *active router*. A standby router is selected to replace the active router should it fail. HSRP provides a mechanism for determining active and standby routers, using the IP addresses on the participating routers. If an active router fails a standby router can take over without a major interruption in the host's connectivity.

HSRP runs on top of User Datagram Protocol (UDP), and uses port number 1985. Routers use their actual IP address as the source address for protocol packets, not the virtual IP address, so that the HSRP routers can identify each other.

For more information on HSRP, see the *Implementing HSRP on Cisco IOS XR Software* module of the *Cisco IOS XR IP Addresses and Services Configuration Guide*.

How to Configure Ethernet Interfaces

The following tasks are described in this section:

- [Configuring a Basic Ethernet Interface, page HC-60](#) (required)
- [Configuring MAC Accounting on an Ethernet Interface, page HC-62](#) (optional)

Configuring a Basic Ethernet Interface

Use the following procedure to create a basic 10-Gigabit Ethernet interface configuration.

SUMMARY STEPS

1. **show version**
2. **show interface**
3. **configure**
4. **interface** *type instance*
5. **ipv4 address** *ip address*
6. **flow-control** {**bidirectional** | **egress** | **ingress**}
7. **mtu** *value*
8. **mac-address** *value1.value2.value3*
9. **no shutdown**
10. **end**
or
commit

11. show interfaces *type instance*

DETAILED STEPS

	Command or Action	Purpose
Step 1	show version Example: RP/0/RP0/CPU0:router# show version	(Optional) Displays the current software version, and can also be used to confirm that the router recognizes the modular services card.
Step 2	show interface Example: RP/0/RP0/CPU0:router# show interface	(Optional) Displays the configured interface and checks the status of each interface port.
Step 3	configure Example: RP/0/RP0/CPU0:router# configure terminal	Enters global configuration mode.
Step 4	interface type instance Example: RP/0/RP0/CPU0:router(config)# interface TenGigE 0/1/0/0	Enters interface configuration mode and specifies the Ethernet interface name and notation <i>rack/slot/module/port</i> . <ul style="list-style-type: none"> The example indicates an 8-port 10-Gigabit Ethernet interface in modular services card slot 1.
Step 5	ipv4 address ip-address mask Example: RP/0/RP0/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224	Assigns an IP address and subnet mask to the interface.
Step 6	flow-control {bidirectional egress ingress} Example: RP/0/RP0/CPU0:router(config-if)# flow control ingress	(Optional) Enables the sending of flow control pause frames on egress, ingress, or bidirectional traffic.
Step 7	mtu value Example: RP/0/RP0/CPU0:router(config-if)# mtu 1448	(Optional) Sets the MTU value for the interface. <ul style="list-style-type: none"> The default is 1514 for normal frames and 1518 for 802.1Q tagged frames. The range for mtu values is 64 to 65535.
Step 8	mac-address value1.value2.value3 Example: RP/0/RP0/CPU0:router(config-if)# mac address 0001.2468.ABCD	(Optional) Sets the MAC layer address of the Management Ethernet interface. <ul style="list-style-type: none"> The values are the high, middle, and low 2 bytes, respectively, of the MAC address in hexadecimal. The range of each 2-byte value is 0 to ffff.
Step 9	no shutdown Example: RP/0/RP0/CPU0:router(config-if)# no shutdown	Removes the shutdown configuration, which forces an interface administratively down.

	Command or Action	Purpose
Step 10	<pre>end OR commit</pre> <p>Example: RP/0/0/CPU0:router(config-if)# end OR RP/0/0/CPU0:router(config-if)# commit </p>	<p>Saves configuration changes.</p> <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting (yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. Entering no exits the configuration session and returns the router to EXEC mode without committing the configuration changes. Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes. Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.
Step 11	<pre>show interfaces type instance</pre> <p>Example: RP/0/RP0/CPU0:router# show interfaces TenGigE 0/3/0/0 </p>	<p>(Optional) Displays statistics for interfaces on the router.</p>

Configuring MAC Accounting on an Ethernet Interface

This task explains how to configure MAC accounting on an Ethernet interface. MAC accounting has special **show** commands, which are illustrated in this procedure. Otherwise, the configuration is the same as configuring a basic Ethernet interface, and the steps can be combined in one configuration session. See “[Configuring a Basic Ethernet Interface](#)” in this module for information about configuring the other common parameters for Ethernet interfaces.

SUMMARY STEPS

1. **configure**
2. **interface** *type instance*
3. **ipv4 address** *ip-address mask*
4. **mac-accounting** { *egress* | *ingress* }
5. **end**
or
commit
6. **show mac-accounting** *type location node-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>configure</code> Example: RP/0/RP0/CPU0:router# configure	Enters global configuration mode.
Step 2	<code>interface type instance</code> Example: RP/0/RP0/CPU0:router(config)# interface TenGigE 0/1/0/0	Enters the interface configuration mode and specifies the Ethernet interface name and notation <i>rack/slot/module/port</i> . <ul style="list-style-type: none"> The example indicates an 8-PORT 10-Gigabit Ethernet interface in modular services card slot 1.
Step 3	<code>ipv4 address ip-address mask</code> Example: RP/0/RP0/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224	Assigns an IP address and subnet mask to the interface.
Step 4	<code>mac-accounting {egress ingress}</code> Example: RP/0/RP0/CPU0:router(config-if)# mac-accounting egress	Generates accounting information for IP traffic based on the source and destination MAC addresses on LAN interfaces. <ul style="list-style-type: none"> To disable MAC accounting, use the no form of this command.
Step 5	<code>end</code> OR <code>commit</code> Example: RP/0/0/CPU0:router(config-if)# end OR RP/0/0/CPU0:router(config-if)# commit	Saves configuration changes. <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: <ul style="list-style-type: none"> Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. Entering no exits the configuration session and returns the router to EXEC mode without committing the configuration changes. Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes. Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.
Step 6	<code>show mac-accounting type location node-id</code> Example: RP/0/RP0/CPU0:router# show mac-accounting TenGigE location 0/2/0/4	Displays MAC accounting statistics for an interface.

Configuration Examples for Ethernet Interfaces

This section provides the following configuration examples:

- [Configuring an Ethernet Interface: Example](#)
- [Configuring MAC-accounting: Example](#)

Configuring an Ethernet Interface: Example

The following example indicates how to configure an interface for the 8-port 10-Gigabit Ethernet modular services card:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface TenGigE 0/0/0/1
RP/0/RP0/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224
RP/0/RP0/CPU0:router(config-if)# flow-control ingress
RP/0/RP0/CPU0:router(config-if)# mtu 1448
RP/0/RP0/CPU0:router(config-if)# mac-address 0001.2468.ABCD
RP/0/RP0/CPU0:router(config-if)# no shutdown
RP/0/RP0/CPU0:router(config-if)# end
Uncommitted changes found, commit them? [yes]: yes
```

```
RP/0/RP0/CPU0:router# show interfaces TenGigE 0/0/0/1
```

```
TenGigE0/0/0/1 is down, line protocol is down
  Hardware is TenGigE, address is 0001.2468.abcd (bia 0001.81a1.6b23)
  Internet address is 172.18.189.38/27
  MTU 1448 bytes, BW 10000000 Kbit
    reliability 0/255, txload Unknown, rxload Unknown
  Encapsulation ARPA,
  Full-duplex, 10000Mb/s, LR
  output flow control is on, input flow control is on
  loopback not set
  ARP type ARPA, ARP timeout 01:00:00
  Last clearing of "show interface" counters never
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 total input drops
    0 drops for unrecognized upper-level protocol
  Received 0 broadcast packets, 0 multicast packets
    0 runts, 0 giants, 0 throttles, 0 parity
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  0 packets output, 0 bytes, 0 total output drops
  Output 0 broadcast packets, 0 multicast packets
  0 output errors, 0 underruns, 0 applique, 0 resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
```

Configuring MAC-accounting: Example

The following example indicates how to configure MAC-accounting on an Ethernet interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface TenGigE 0/0/0/2
RP/0/RP0/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224
RP/0/RP0/CPU0:router(config-if)# mac-accounting egress
RP/0/RP0/CPU0:router(config-if)# commit
RP/0/RP0/CPU0Sep 19 20:21:11.330 : config[65726]: %LIBTARCFG-6-COMMIT : Configur
```

```

ation committed by user 'unknown'. Use 'show commit changes 1000003461' to view the
e changes.
RP/0/RP0/CPU0:router(config-if)# exit
RP/0/RP0/CPU0:router(config)# exit

```

Where to Go Next

For information about configuring Gigabit Ethernet management interfaces for the shelf controller (SC), route processor (RP), and distributed RP, see [“Configuring Management Interfaces on Cisco IOS XR Software”](#).

For information about configuring VLAN subinterfaces on an Ethernet interface see [“Configuring 802.1Q VLAN Interfaces on Cisco IOS XR Software”](#).

For information about IPv6 see the *Implementing Access Lists and Prefix Lists on Cisco IOS XR Software* module in the *Cisco IOS XR IP Addresses and Services Configuration Guide*.

Additional References

The following sections provide references related to implementing Gigabit Ethernet interfaces.

Related Documents

Related Topic	Document Title
Cisco IOS XR master command reference	<i>Cisco IOS XR Master Commands List</i> , Release 3.2
Cisco IOS XR interface configuration commands	<i>Cisco CRS-1 Series Interface and Hardware Component Command Reference</i>
Information about user groups and task IDs	<i>Cisco IOS XR Task ID Reference Guide</i>
Information about configuring interfaces and other components on the Cisco CRS-1 from a remote Craft Works Interface (CWI) client management application	<i>Cisco CRS-1 Series Carrier Routing System Craft Works Interface Configuration Guide</i>

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
There are no applicable MIBs for this module.	To locate and download MIBs for selected platforms using Cisco IOS XR Software, use the Cisco MIB Locator found at the following URL: http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of 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.	http://www.cisco.com/techsupport