



Configuring Ethernet Interfaces on Cisco IOS XR Software

This module describes the configuration of Ethernet interfaces on the Cisco XR 12000 Series Router. The distributed Gigabit Ethernet, 10-Gigabit Ethernet, and Fast 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 switches.

Feature History for Configuring Ethernet Interfaces on Cisco IOS XR Software

Release	Modification
Release 3.2	Support was added for the Cisco XR 12000 Series Router. Support was added on the Cisco XR 12000 Series Router for the following SPAs: <ul style="list-style-type: none">• 1-Port 10-Gigabit Ethernet SPA• 5-Port Gigabit Ethernet SPA• 10-Port Gigabit Ethernet SPA
Release 3.3.0	Support was added for egress MAC accounting on the 8-port 10-Gigabit Ethernet PLIM. Support was added on the Cisco XR 12000 Series Router for the following SIPs: <ul style="list-style-type: none">• Cisco XR 12000 SIP-401• Cisco XR 12000 SIP-501• Cisco XR 12000 SIP-601 Support was added on the Cisco XR 12000 Series Router for the 8-Port FastEthernet SPA.
Release 3.4.0	The Layer 2 Virtual Private Network (L2VPN) feature was first supported on Ethernet interfaces. Support was added for the 8-Port 1-Gigabit Ethernet SPA.
Release 3.4.1	Support was added on the Cisco XR 12000 Series Router for the 2-Port Gigabit Ethernet SPA.

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Prerequisites for Configuring Ethernet Interfaces

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

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

- Confirm that at least one of the following line cards supported on the router is installed:
 - 4-Port 1-Gigabit Ethernet physical layer interface module (PLIM)
 - 2-Port Gigabit Ethernet SPA
 - 5-Port Gigabit Ethernet SPA
 - 10-Port Gigabit Ethernet SPA
 - 1-Port 10-Gigabit Ethernet SPA
 - 1-Port 10-Gigabit Ethernet WAN SPA
 - 8-Port Gigabit Ethernet SPA
 - 8-Port Fast 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*.
- If you are configuring a 10-Gigabit Ethernet interface on a 10-GE DWDM PLIM, you must have configured the DWDM controller.

Information About Configuring Ethernet

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

The Cisco XR 12000 Series Router supports Fast Ethernet (100 Mbps), Gigabit Ethernet (1000 Mbps), and 10-Gigabit Ethernet (10 Gbps) interfaces.

This section provides the following information sections:

- [Default Configuration Values for Gigabit Ethernet and 10-Gigabit Ethernet, page 95](#)
- [Gigabit Ethernet Protocol Standards Overview, page 97](#)
- [MAC Address, page 98](#)
- [MAC Accounting, page 99](#)
- [Ethernet MTU, page 99](#)
- [Flow Control on Ethernet Interfaces, page 99](#)
- [802.1Q VLAN, page 100](#)
- [VRRP, page 100](#)
- [HSRP, page 100](#)
- [Duplex Mode on Fast Ethernet Interfaces, page 101](#)
- [Fast Ethernet Interface Speed, page 101](#)
- [Link Autonegotiation on Ethernet Interfaces, page 101](#)
- [Carrier Delay on Ethernet Interfaces, page 102](#)

Default Configuration Values for Gigabit Ethernet and 10-Gigabit Ethernet

Table 2 describes the default interface configuration parameters that are present when an interface is enabled on a Gigabit Ethernet or 10-Gigabit Ethernet modular services card and its associated PLIM.

**Note**

You must use 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 2 *Gigabit Ethernet and 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 on ingress off

Table 2 **Gigabit Ethernet and 10-Gigabit Ethernet Modular Services Card Default Configuration Values**

Parameter	Configuration File Entry	Default Value
MTU	mtu	<ul style="list-style-type: none"> 1514 bytes for normal frames 1518 bytes for 802.1Q tagged frames. 1522 bytes for Q-in-Q frames.
MAC address	mac address	Hardware burned-in address (BIA)

Default Configuration Values for Fast Ethernet

[Table 3](#) describes the default interface configuration parameters that are present when an interface is enabled on the Fast Ethernet SPA 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 3 **Fast Ethernet Default Configuration Values**

Parameter	Configuration File Entry	Default Value
MAC accounting	mac-accounting	off
Duplex operation	duplex full duplex half	Auto-negotiates duplex operation
MTU	mtu	1500 bytes
Interface speed	speed	100 Mbps
Auto-negotiation	negotiation auto	disable

Layer 2 VPN on Ethernet Interfaces

Layer 2 Virtual Private Network (L2VPN) connections emulate the behavior of a LAN across an L2 switched, IP or MPLS-enabled IP network, allowing Ethernet devices to communicate with each other as if they were connected to a common LAN segment.

The L2VPN feature enables service providers (SPs) to provide Layer 2 services to geographically disparate customer sites. Typically, an SP uses an access network to connect the customer to the core network. This access network may use a mixture of Layer 2 technologies, such as Ethernet, ATM and Frame Relay. The connection between the customer site and the nearby SP edge router is known as an Attachment Circuit (AC).

Traffic from the customer travels over this link to the edge of the SP core network. The traffic then tunnels through an L2VPN over the SP core network to another edge router. The edge router sends the traffic down another attachment circuit (AC) to the customer's remote site.

The L2VPN feature enables users to implement different types of end-to-end services.

Cisco IOS XR software supports a point-to-point end-to-end service, where two Ethernet circuits are connected together. An L2VPN Ethernet port can operate in one of two modes:

- **Port Mode**—In this mode, all packets reaching the port are sent over the PW (pseudowire), regardless of any VLAN tags that are present on the packets. In VLAN mode, the configuration is performed under the `l2transport` configuration mode.
- **VLAN Mode**—Each VLAN on a CE (customer edge) or access network to PE (provider edge) link can be configured as a separate L2VPN connection (using either VC type 4 or VC type 5). In VLAN mode, the configuration is performed under the individual subinterface.

Switching can take place in three ways:

- **AC-to-PW**—Traffic reaching the PE is tunneled over a PW (and conversely, traffic arriving over the PW is sent out over the AC). This is the most common scenario.
- **Local switching**—Traffic arriving on one AC is immediately sent out of another AC without passing through a pseudowire.
- **PW stitching**—Traffic arriving on a PW is not sent to an AC, but is sent back into the core over another PW.

Keep the following in mind when configuring L2VPN on an Ethernet interface:

- L2VPN links support QoS (Quality of Service) and MTU (maximum transmission unit) configuration.
- If your network requires that packets are transported transparently, you may need to modify the packet's destination MAC (Media Access Control) address at the edge of the Service Provider (SP) network. This prevents the packet from being consumed by the devices in the ST network.
- Cisco IOS XR software supports up to 4,000 ACs per line card. Note that not all line cards can support as many as 4,000 ACs. Refer to the specifications of the individual line card for details on the maximum number of ACs supported.

Use the **show interfaces** command to display AC and PW information.

To configure a point-to-point pseudowire `xconnect` on an AC, see the *Implementing MPLS Layer 2 VPNs* module of the *Cisco IOS XR Multiprotocol Label Switching Configuration Guide*.

To attach Layer 2 service policies, such as QoS, to the Ethernet interface, refer to the appropriate Cisco IOS XR software configuration guide.

Gigabit Ethernet Protocol Standards Overview

The Gigabit Ethernet interfaces support the following protocol standards:

- [IEEE 802.3 Physical Ethernet Infrastructure, page 98](#)
- [IEEE 802.3ab 1000BASE-T Gigabit Ethernet, page 98](#)
- [IEEE 802.3z 1000 Mbps Gigabit Ethernet, page 98](#)
- [IEEE 802.3ae 10 Gbps Ethernet, page 98](#)

These standards are further described in the sections that follow.

IEEE 802.3 Physical Ethernet Infrastructure

The IEEE 802.3 protocol standards define the physical layer and MAC sublayer of the data link layer of wired Ethernet. IEEE 802.3 uses Carrier Sense Multiple Access with Collision Detection (CSMA/CD) access at a variety of speeds over a variety of physical media. The IEEE 802.3 standard covers 10 Mbps Ethernet. Extensions to the IEEE 802.3 standard specify implementations for Gigabit Ethernet, 10-Gigabit Ethernet, and Fast Ethernet.

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 technology, it does not need the carrier-sensing multiple-access with the CSMA/CD protocol that defines slower, half-duplex Ethernet technologies. In every other respect, 10-Gigabit Ethernet remains true to the original Ethernet model.

IEEE 802.3ba 100 Gbps Ethernet

IEEE 802.3ba is supported on the Cisco 1-Port 100-Gigabit Ethernet PLIM beginning in Cisco IOS XR 4.0.1.

MAC Address

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

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.

These statistics are used for traffic monitoring, debugging and billing. For example, with this feature you can determine the volume of traffic that is being sent to and/or received from various peers at NAPS/peering points. This feature is currently supported on Ethernet, FastEthernet, and bundle interfaces and supports Cisco Express Forwarding (CEF), distributed CEF (dCEF), flow, and optimum switching.

**Note**

A maximum of 512 MAC addresses per trunk interface are supported for MAC address accounting.

Ethernet MTU

The Ethernet maximum transmission unit (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 software 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.

**Note**

IPv6 does not support fragmentation.

- 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 an IP packet that is too large.

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).

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.

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 *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 switchover 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 *Cisco IOS XR IP Addresses and Services Configuration Guide*.

Duplex Mode on Fast Ethernet Interfaces

Fast Ethernet ports support the duplex transmission type. Full-duplex mode enables the simultaneous data transmission between a sending station and a receiving station, while half-duplex mode enables data transmission in only one direction at a time.

When configuring duplex mode on a Fast Ethernet interface, keep the following in mind:

- If auto-negotiation is enabled on the interface, the default is duplex negotiated.
- If auto-negotiation is disabled on the interface, the default is full-duplex.



Note

You can configure duplex mode on Fast Ethernet interfaces only. Gigabit Ethernet and 10-Gigabit Ethernet interfaces always run in full-duplex mode.

Fast Ethernet Interface Speed

You can configure the interface speed on Fast Ethernet interfaces. Keep the following in mind when configuring the speed for a Fast Ethernet interface:

- If auto-negotiation is enabled on an interface, the default is speed negotiated.
- If auto-negotiation is disabled on an interface, the default speed is the maximum speed allowed on the interface.



Note

Both ends of a link must have the same interface speed. A manually configured interface speed overrides any auto-negotiated speed, which can prevent a link from coming up if the configured interface speed at one end of a link is different from the interface speed on the other end.

Link Autonegotiation on Ethernet Interfaces

Link autonegotiation ensures that devices that share a link segment are automatically configured with the highest performance mode of interoperation. Use the **negotiation auto** command in interface configuration mode to enable link autonegotiation on an Ethernet interface. On line card Ethernet interfaces, link autonegotiation is disabled by default.



Note

The **negotiation auto** command is available on Gigabit Ethernet and Fast Ethernet interfaces only.

[Table 4](#) describes the performance of the system for different combinations of the duplex and speed modes. The specified **duplex** command configured with the specified **speed** command produces the resulting system action, provided that you have configured autonegotiation on the interface.

Table 4 *Relationship Between duplex and speed Commands*

duplex Command	speed Command	Resulting System Action
no duplex	no speed	Auto-negotiates both speed and duplex modes.
no duplex	speed 1000	Auto-negotiates for duplex mode and forces 1000 Mbps.
no duplex	speed 100	Auto-negotiates for duplex mode and forces 100 Mbps.
no duplex	speed 10	Auto-negotiates for duplex mode and forces 10 Mbps.
full-duplex	no speed	Forces full duplex and auto-negotiates for speed.
full-duplex	speed 1000	Forces full duplex and 1000 Mbps.
full-duplex	speed 100	Forces full duplex and 100 Mbps.
full-duplex	speed 10	Forces full duplex and 10 Mbps.
half-duplex	no speed	Forces half duplex and auto-negotiates for speed.
half-duplex	speed 1000	Forces half duplex and 1000 Mbps.
half-duplex	speed 100	Forces half duplex and 100 Mbps.
half-duplex	speed 10	Forces half duplex and 10 Mbps.

Carrier Delay on Ethernet Interfaces

When enabled on an Ethernet interface, the Carrier Delay feature slows the response of the system to line-up or line-down events. You can configure both Carrier Delay up and Carrier Delay down on an interface at the same time.

Carrier Delay up suppresses short line flaps where the line is down, then comes up, then goes down again. A line that was previously down must be up longer than the duration specified for the **carrier-delay up** command before the system is informed that the interface has come up. All flaps that are shorter than the duration specified for the **carrier-delay up** command are suppressed.

Configuring Carrier Delay up helps to ensure that a line is reasonably stable before the system is informed that the interface is up and ready to forward traffic.

Carrier Delay down suppresses short line flaps where the line is up, then goes down, then comes up again. A line that was previously up must be down longer than the duration specified for the **carrier-delay down** command before the system is informed that the interface has gone down. All flaps that are shorter than the value specified for the **carrier-delay down** command are suppressed.

Configuring Carrier Delay down can be beneficial in suppressing very short link flaps, thereby preventing interface flaps. Alternatively, configuring this feature can be beneficial in allowing other line protection equipment to have enough time to intervene.

How to Configure Ethernet

This section provides the following configuration procedures:

- [Configuring Ethernet Interfaces, page 103](#)

Configuring Ethernet Interfaces

This section provides the following configuration procedures:

- [Configuring Gigabit Ethernet Interfaces, page 103](#)
- [Configuring a Fast Ethernet Interface, page 106](#)
- [Configuring a L2VPN Ethernet Port, page 110](#)
- [Configuring MAC Accounting on an Ethernet Interface, page 108](#)

Configuring Gigabit Ethernet Interfaces

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

SUMMARY STEPS

1. **show version**
2. **show interfaces** [**GigabitEthernet** | **TenGigE**] *interface-path-id*
3. **configure**
4. **interface** [**GigabitEthernet** | **TenGigE**] *interface-path-id*
5. **ipv4 address** *ip-address mask*
6. **flow-control** {**bidirectional** | **egress** | **ingress**}
7. **mtu** *bytes*
8. **mac-address** *value1.value2.value3*
9. **negotiation auto** (on Gigabit Ethernet and Fast Ethernet interfaces only)
10. **no shutdown**
11. **end**
or
commit
12. **show interfaces** [**GigabitEthernet** | **TenGigE**] *interface-path-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	show version Example: RP/0/0/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 interfaces [GigabitEthernet TenGigE] <i>interface-path-id</i> Example: RP/0/0/CPU0:router# show interfaces TenGigE 0/1/0/0	(Optional) Displays the configured interface and checks the status of each interface port. Possible interface types for this procedure are: <ul style="list-style-type: none"> • GigabitEthernet • TenGigE

	Command or Action	Purpose
Step 3	configure Example: RP/0/0/CPU0:router# configure terminal	Enters global configuration mode.
Step 4	interface [GigabitEthernet TenGigE] <i>interface-path-id</i> Example: RP/0/0/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> . Possible interface types for this procedure are: <ul style="list-style-type: none"> GigabitEthernet TenGigE Note The example indicates an 8-port 10-Gigabit Ethernet interface in modular services card slot 1.
Step 5	ipv4 address <i>ip-address mask</i> Example: RP/0/0/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224	Assigns an IP address and subnet mask to the interface. <ul style="list-style-type: none"> Replace <i>ip-address</i> with the primary IPv4 address for the interface. Replace <i>mask</i> with the mask for the associated IP subnet. The network mask can be specified in either of two ways: <ul style="list-style-type: none"> The network mask can be a four-part dotted decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means that the corresponding address bit belongs to the network address. The network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are ones, and the corresponding bits of the address are network address.
Step 6	flow-control { bidirectional egress ingress } Example: RP/0/0/CPU0:router(config-if)# flow control ingress	(Optional) Enables the sending and processing of flow control pause frames. <ul style="list-style-type: none"> egress—Enables the sending of flow control pause frames in egress. ingress—Enables the processing of received pause frames on ingress. bidirectional—Enables the sending of flow control pause frames in egress and the processing of received pause frames on ingress.
Step 7	mtu <i>bytes</i> Example: RP/0/0/CPU0:router(config-if)# mtu 1448	(Optional) Sets the MTU value for the interface. <ul style="list-style-type: none"> The default is 1514 bytes for normal frames and 1518 bytes for 802.1Q tagged frames. The range for Gigabit Ethernet and 10-Gigabit Ethernet mtu values is 64 bytes to 65535 bytes.

	Command or Action	Purpose
Step 8	mac-address <i>value1.value2.value3</i> Example: RP/0/0/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	negotiation auto Example: RP/0/0/CPU0:router(config-if)# negotiation auto	(Optional) Enables autonegotiation on a Gigabit Ethernet interface. <ul style="list-style-type: none"> Autonegotiation must be explicitly enabled on both ends of the connection, or speed and duplex settings must be configured manually on both ends of the connection. If autonegotiation is enabled, any speed or duplex settings that you configure manually take precedence. Note The negotiation auto command is available on Gigabit Ethernet and Fast Ethernet interfaces only.
Step 10	no shutdown Example: RP/0/0/CPU0:router(config-if)# no shutdown	Removes the shutdown configuration, which forces an interface administratively down.
Step 11	end or commit 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 12	show interfaces [GigabitEthernet TenGigE] <i>interface-path-id</i> Example: RP/0/0/CPU0:router# show interfaces TenGigE 0/3/0/0	(Optional) Displays statistics for interfaces on the router.

What to Do Next

- To configure MAC Accounting on the Ethernet interface, see the “[Configuring MAC Accounting on an Ethernet Interface](#)” section later in this module.
- To configure an AC on the Ethernet port for Layer 2 VPN implementation, see the “[Configuring a L2VPN Ethernet Port](#)” section later in this module.
- To attach Layer 3 service policies, such as Multiprotocol Label Switching (MPLS) or Quality of Service (QoS), to the Ethernet interface, refer to the appropriate Cisco IOS XR software configuration guide.

Configuring a Fast Ethernet Interface

Use the following procedure to create a basic Fast Ethernet interface configuration.



Note

Fast Ethernet is supported on the Cisco XR 12000 Series Router only.

SUMMARY STEPS

1. **configure**
2. **interface fastethernet** *interface-path-id*
3. **ipv4 address** *ip-address mask*
4. **mtu** *bytes*
5. **duplex full**
6. **speed** *speed*
7. **negotiation auto**
8. **no shutdown**
9. **end**
or
commit
10. **show interfaces fastethernet** *interface-path-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/0/CPU0:router# configure terminal	Enters global configuration mode.
Step 2	interface fastethernet <i>interface-path-id</i> Example: RP/0/0/CPU0:router(config)# interface fastethernet 0/0/2/1	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 the second interface on an 8-port Fast Ethernet SPA in slot 0, and SPA subslot 2.

	Command or Action	Purpose
Step 3	ipv4 address <i>ip-address mask</i> Example: RP/0/0/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224	Assigns an IP address and subnet mask to the interface. <ul style="list-style-type: none"> Replace <i>ip-address</i> with the primary IPv4 address for the interface. Replace <i>mask</i> with the mask for the associated IP subnet. The network mask can be specified in either of two ways: <ul style="list-style-type: none"> The network mask can be a four-part dotted decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means that the corresponding address bit belongs to the network address. The network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are ones, and the corresponding bits of the address are network address.
Step 4	mtu <i>bytes</i> Example: RP/0/0/CPU0:router(config-if# mtu 1448	(Optional) Sets the MTU value for the interface. <ul style="list-style-type: none"> The default is 1500 bytes. The range for Fast Ethernet mtu values is 0 to 10240 bytes.
Step 5	duplex <i>full</i> Example: RP/0/0/CPU0:router(config-if)# duplex full	(Optional) Enables full-duplex mode. Use the duplex half command to enable half-duplex mode. <ul style="list-style-type: none"> Duplex operation is auto-negotiated by default. If auto-negotiation is enabled, any user-defined duplex value is ignored.
Step 6	speed <i>speed</i> Example: RP/0/0/CPU0:router(config-if)# speed 100	(Optional) Sets the speed of the interface. Valid options are 10 Mbps or 100 Mbps. <ul style="list-style-type: none"> The default is 100 Mbps. If auto-negotiation is enabled, any user-defined speed value is ignored.
Step 7	negotiation auto Example: RP/0/0/CPU0:router(config-if)# negotiation auto	(Optional) Enables auto-negotiation on the interface. <ul style="list-style-type: none"> Auto-negotiation must be explicitly enabled on both ends of the connection, or speed and duplex settings must be configured manually on both ends of the connection. If auto-negotiation is enabled, any manually-configured speed or duplex settings take precedence.
Step 8	no shutdown Example: RP/0/0/CPU0:router(config-if)# no shutdown	Removes the shutdown configuration, which removes the forced administrative down on the interface, enabling it to move to an up or down state.

	Command or Action	Purpose
Step 9	<p>end OR commit</p> <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: 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 10	<p>show interfaces fastethernet <i>interface-path-id</i></p> <p>Example: RP/0/0/CPU0:router# show interfaces fastethernet 0/0/1/1</p>	<p>(Optional) Displays statistics for interfaces on the router.</p>

What to Do Next

- To configure an AC on the Fast Ethernet port for Layer 2 VPN implementation, see the [“Configuring a L2VPN Ethernet Port”](#) section later in this module.
- To attach Layer 3 service policies, such as Multiprotocol Label Switching (MPLS) or Quality of Service (QoS), to the Fast Ethernet interface, refer to the appropriate Cisco IOS XR software configuration guide.

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 Gigabit Ethernet Interfaces”](#) in this module for information about configuring the other common parameters for Ethernet interfaces.

SUMMARY STEPS

- configure**
- interface** [GigabitEthernet | TenGigE | fastethernet] *interface-path-id*
- ipv4 address** *ip-address mask*
- mac-accounting** {egress | ingress}

5. **end**
or
commit
6. **show mac-accounting** *type location instance*

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/RP0/CPU0:router# configure	Enters global configuration mode.
Step 2	interface [GigabitEthernet TenGigE fastethernet] <i>interface-path-id</i> Example: RP/0/RP0/CPU0:router(config)# interface TenGigE 0/1/0/0	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
Step 3	ipv4 address <i>ip-address mask</i> 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. <ul style="list-style-type: none">• Replace <i>ip-address</i> with the primary IPv4 address for the interface.• Replace <i>mask</i> with the mask for the associated IP subnet. The network mask can be specified in either of two ways:<ul style="list-style-type: none">– The network mask can be a four-part dotted decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means that the corresponding address bit belongs to the network address.– The network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are ones, and the corresponding bits of the address are network address.
Step 4	mac-accounting { egress ingress } 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.

	Command or Action	Purpose
Step 5	end OR commit Example: RP/0/RP0/CPU0:router(config-if)# end OR RP/0/RP0/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	show mac-accounting type location instance Example: RP/0/RP0/CPU0:router# show mac-accounting TenGigE location 0/2/0/4	Displays MAC accounting statistics for an interface.

Configuring a L2VPN Ethernet Port

Use the following procedure to configure an L2VPN Ethernet port.



Note

The steps in this procedure configure the L2VPN Ethernet port to operate in port mode.

SUMMARY STEPS

1. **configure**
2. **interface** [**GigabitEthernet** | **TenGigE**] *interface-path-id*
3. **l2transport**
4. **l2protocol** {**cdp** | **pvst** | **stp** | **vtp**} {[**forward** | **tunnel**] [**experimental bits**] | **drop**}
5. **end**
OR
commit
6. **show interfaces** [**GigabitEthernet** | **TenGigE**] *interface-path-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/0/CPU0:router# configure terminal	Enters global configuration mode.
Step 2	interface [GigabitEthernet TenGigE] <i>interface-path-id</i> Example: RP/0/0/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> . Possible interface types for this procedure are: <ul style="list-style-type: none"> GigabitEthernet TenGigE
Step 3	l2transport Example: RP/0/0/CPU0:router(config-if)# l2transport	Enables Layer 2 transport mode on a port and enter Layer 2 transport configuration mode.
Step 4	l2protocol { cdp pvst stp vtp }{ [forward tunnel] [experimental bits] [drop] } Example: RP/0/0/CPU0:router(config-if-l2)# l2protocol stp tunnel	Configures Layer 2 protocol tunneling and protocol data unit (PDU) filtering on an interface. Possible protocols and options are: <ul style="list-style-type: none"> cdp—Cisco Discovery Protocol (CDP) tunneling and data unit parameters. pvst—Configures VLAN spanning tree protocol tunneling and data unit parameters. stp—spanning tree protocol tunneling and data unit parameters. vtp—VLAN trunk protocol tunneling and data unit parameters. tunnel—(Optional) Tunnels the packets associated with the specified protocol. experimental bits—(Optional) Modifies the MPLS experimental bits for the specified protocol. drop—(Optional) Drop packets associated with the specified protocol.

	Command or Action	Purpose
Step 5	<p>end or commit</p> <p>Example: RP/0/0/CPU0:router(config-if-12)# end or RP/0/0/CPU0:router(config-if-12)# 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: 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	<p>show interfaces [GigabitEthernet TenGigE] interface-path-id</p> <p>Example: RP/0/0/CPU0:router# show interfaces TenGigE 0/3/0/0</p>	<p>(Optional) Displays statistics for interfaces on the router.</p>

What to Do Next

To configure a point-to-point pseudowire xconnect on an AC, see the *Implementing MPLS Layer 2 VPNs* module of the *Cisco IOS XR Multiprotocol Label Switching Configuration Guide*.

To attach Layer 2 service policies, such as quality of service (QoS), to the Ethernet interface, refer to the appropriate Cisco IOS XR software configuration guide.

Configuration Examples for Ethernet

This section provides the following configuration examples:

- [Configuring an Ethernet Interface: Example, page 113](#)
- [Configuring a Fast Ethernet Interface: Example, page 113](#)
- [Configuring MAC-Accounting: Example, page 114](#)
- [Configuring a Layer 2 VPN AC: Example, page 114](#)

Configuring an Ethernet Interface: Example

The following example shows how to configure an interface for a 10-Gigabit Ethernet modular services card:

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

```
RP/0/0/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, L/R
  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 a Fast Ethernet Interface: Example

The following example indicates how to configure an interface for a Fast Ethernet SPA:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface fastethernet 0/0/2/0
RP/0/0/CPU0:router(config-if)# ipv4 address 172.30.1.2 255.255.255.224
RP/0/0/CPU0:router(config-if)# duplex full
RP/0/0/CPU0:router(config-if)# mtu 1514
RP/0/0/CPU0:router(config-if)# speed 100
RP/0/0/CPU0:router(config-if)# no shutdown
RP/0/0/CPU0:router(config-if)# end
Uncommitted changes found, commit them? [yes]: yes
```

```
RP/0/0/CPU0:router# show interfaces fastethernet 0/0/2/0
```

```
FastEthernet0/0/2/0 is up, line protocol is up
  Hardware is FastEthernet, address is 000f.f83b.30c8 (bia 000f.f83b.30c8)
  Internet address is 172.30.1.2/24
  MTU 1514 bytes, BW 1000000 Kbit
```

```

    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA,
Duplex unknown, 100Mb/s, TX, link type is force-up
output flow control is off, input flow control is off
loopback not set
ARP type ARPA, ARP timeout 04:00:00
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/RSP0RP00/CPU0:router# configure
RP/0/RSP0RP00/CPU0:router(config)# interface TenGigE 0/0/0/2
RP/0/RSP0RP00/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224
RP/0/RSP0RP00/CPU0:router(config-if)# mac-accounting egress
RP/0/RSP0RP00/CPU0:router(config-if)# commit
RP/0/RSP0RP00/CPU0:router(config-if)# exit
RP/0/RSP00/CPU0:router(config)# exit

```

Configuring a Layer 2 VPN AC: Example

The following example indicates how to configure a Layer 2 VPN AC on an Ethernet interface:

```

RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface TenGigE 0/0/0/2
RP/0/0/CPU0:router(config-if)# l2transport
RP/0/0/CPU0:router(config-if-l2)# l2protocol pvst tunnel
RP/0/0/CPU0:router(config-if-l2)# commit

```

Where to Go Next

When you have configured an Ethernet interface, you can configure individual VLAN subinterfaces on that Ethernet interface.

For information about modifying Ethernet management interfaces for the shelf controller (SC), route processor (RP), and distributed RP, see the [Advanced Configuration and Modification of the Management Ethernet Interface on Cisco IOS XR Software](#) module later in this document.

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

These sections provide references related to implementing Gigabit, 10-Gigabit, and Fast Ethernet interfaces.

Related Documents

Related Topic	Document Title
Cisco IOS XR master command reference	<i>Cisco IOS XR Master Commands List</i>
Cisco IOS XR interface configuration commands	<i>Cisco IOS XR Interface and Hardware Component Command Reference</i>
Information about user groups and task IDs	<i>Cisco IOS XR Interface and Hardware Component Command Reference</i>

Standards

Standards	Title
IEEE 802.1ag	—
ITU-T Y.1731	

MIBs

MIBs	MIBs Link
IEEE CFM MIB	To locate and download MIBs for selected platforms using Cisco IOS XR Software, use the Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

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/support