



Configuring Ethernet Interfaces on the Cisco ASR 9000 Series Router

This module describes the configuration of Ethernet interfaces on the Cisco ASR 9000 Series Aggregation Services Routers.

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 Layer 3 switches.

Feature History for Configuring Ethernet Interfaces on the Cisco ASR 9000 Series Router

Release	Modification
Release 3.7.2	Support was added on the Cisco ASR 9000 Series Router for the following line cards: <ul style="list-style-type: none">• 40-Port Gigabit Ethernet Medium Queue and High Queue Line Cards (A9K-40GE-B and A9K-40GE-E)• 4-Port 10-Gigabit Ethernet Medium Queue and High Queue Line Cards (A9K-4T-B and A9K-4T-E)• 8-Port 10-Gigabit Ethernet Medium Queue and High Queue DX Line Cards (A9K-8T/4-B and A9K-8T/4-E) (2:1 oversubscribed)

Release 3.9.0	<p>Support was added on the Cisco ASR 9000 Series Router for the following line cards:</p> <ul style="list-style-type: none">• 40-Port Gigabit Ethernet Low Queue Line Card (A9K-40GE-L)• 4-Port 10-Gigabit Ethernet Low Queue Line Card (A9K-4T-L)• 8-Port 10-Gigabit Ethernet Low Queue DX Line Card (A9K-8T/4-L) (2:1 oversubscribed)• 8-Port 10-Gigabit Ethernet Low and High Queue Line Card (A9K-8T-L and A9K-8T-E)• 2-Port 10-Gigabit Ethernet, 20-Port Gigabit Ethernet Medium Queue and High Queue Combination Line Cards (A9K-2T20GE-B and A9K-2T20GE-L) <p>Support for the following features was added:</p> <ul style="list-style-type: none">• Frequency Synchronization• SyncE
Release 3.9.1	<p>Support was added on the Cisco ASR 9000 Series Router for the following line cards:</p> <ul style="list-style-type: none">• 8-Port 10-Gigabit Ethernet Medium Queue Line Card (A9K-8T-B)• 16-Port 10-Gigabit Ethernet SFP+ Line Card (A9K-16T/8-B and A9K-16T/8-B+AIP)
Release 4.0.1	<p>Support for Layer 2 statistics collection for performance monitoring on Layer 2 subinterfaces (EFPs) is added.</p>

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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:
 - 2-Port 10-Gigabit Ethernet, 20-Port Gigabit Ethernet Combination line card (A9K-2T20GE-B and A9K-2T20GE-L)
 - 4-Port 10-Gigabit Ethernet line card (A9K-4T-L, -B, or -E)
 - 8-Port 10-Gigabit Ethernet DX line card (A9K-8T/4-L, -B, or -E)
 - 8-Port 10-Gigabit Ethernet line card (A9K-8T-L, -B, or -E)
 - 16-Port 10-Gigabit Ethernet SFP+ line card (A9K-16T/8-B and A9K-16T/8-B+AIP)
 - 40-Port Gigabit Ethernet line card (A9K-40GE-L, -B, or -E)
- 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

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 ASR 9000 Series Router supports Gigabit Ethernet (1000 Mbps) and 10-Gigabit Ethernet (10 Gbps) interfaces.

This section provides the following information sections:

- [16-Port 10-Gigabit Ethernet SFP+ Line Card, page 24](#)
- [Default Configuration Values for Gigabit Ethernet and 10-Gigabit Ethernet, page 25](#)
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16-Port 10-Gigabit Ethernet SFP+ Line Card

The 16-Port10-Gigabit Ethernet SFP+ line card is a Small Form Factor (SFP transceiver) optical line card introduced in Cisco IOS XR Release 3.9.1 on the Cisco ASR 9000 Series Router. The 16-Port10-Gigabit Ethernet SFP+ line card supports all of the Gigabit Ethernet commands and configurations currently supported on the router.

The 16-Port10-Gigabit Ethernet SFP+ line card is compatible with all existing Cisco ASR 9000 Series Router line cards, route/switch processors (RSPs), and chassis.

Features

The 16-Port10-Gigabit Ethernet SFP+ line card supports the following features:

- 16 10-Gigabit Ethernet ports
- 128 10-Gigabit Ethernet ports per system
- 1.28 Tbps per system
- 160 Gbps forwarding
- 120 Gbps bidirectional performance
- SR/LR/ER SFP+ optics
- Feature parity with existing line cards
- Unicast and multicast forwarding at 160 Gbps, with zero packet loss during RSP switchover

Restrictions

The following features are not supported on the 16-Port10-Gigabit Ethernet SFP+ line card:

- DWDM (G.709)

Default Configuration Values for Gigabit Ethernet and 10-Gigabit Ethernet

Table 3 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 3 *Gigabit Ethernet and 10-Gigabit Ethernet Modular Services Card Default Configuration Values*

Parameter	Configuration File Entry	Default Value
Flow control	flow-control	egress on ingress off
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)

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. On the Cisco ASR 9000 Series Router, this access network is typically Ethernet.

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.

On the Cisco ASR 9000 Series Router, an AC is an interface that is attached to an L2VPN component, such as a bridge domain, pseudowire, or local connect.

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 SP network.

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

To configure a point-to-point pseudowire xconnect on an AC, refer to these documents:

- *Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Configuration Guide*
- *Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Command Reference*

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 27](#)
- [IEEE 802.3ab 1000BASE-T Gigabit Ethernet, page 27](#)
- [IEEE 802.3z 1000 Mbps Gigabit Ethernet, page 27](#)
- [IEEE 802.3ae 10 Gbps Ethernet, page 27](#)

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.

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 configured for ingress, egress, and bidirectional traffic. By default, it is disabled.

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* module of *Cisco ASR 9000 Series Router 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* module of *Cisco ASR 9000 Series Router IP Addresses and Services Configuration Guide*.

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 interfaces only.

Subinterfaces on the Cisco ASR 9000 Series Router

In Cisco IOS XR, interfaces are, by default, main interfaces. A main interface is also called a trunk interface, which is not to be confused with the usage of the word trunk in the context of VLAN trunking.

There are three types of trunk interfaces:

- Physical
- Bundle

On the Cisco ASR 9000 Series Router, physical interfaces are automatically created when the router recognizes a card and its physical interfaces. However, bundle interfaces are not automatically created. They are created when they are configured by the user.

The following configuration samples are examples of trunk interfaces being created:

- interface gigabitethernet 0/5/0/0
- interface bundle-ether 1

A subinterface is a logical interface that is created under a trunk interface.

To create a subinterface, the user must first identify a trunk interface under which to place it. In the case of bundle interfaces, if one does not already exist, a bundle interface must be created before any subinterfaces can be created under it.

The user then assigns a subinterface number to the subinterface to be created. The subinterface number must be a positive integer from zero to some high value. For a given trunk interface, each subinterface under it must have a unique value.

Subinterface numbers do not need to be contiguous or in numeric order. For example, the following subinterface numbers would be valid under one trunk interface:

1001, 0, 97, 96, 100000

Subinterfaces can never have the same subinterface number under one trunk.

In the following example, the card in slot 5 has trunk interface, GigabitEthernet 0/5/0/0. A subinterface, GigabitEthernet 0/5/0/0.0, is created under it.

```
RP/0/RSP0/CPU0:router# conf
Mon Sep 21 11:12:11.722 EDT
RP/0/RSP0/CPU0:router(config)# interface GigabitEthernet0/5/0/0.0
RP/0/RSP0/CPU0:router(config-subif)# encapsulation dot1q 100
RP/0/RSP0/CPU0:router(config-subif)# commit

RP/0/RSP0/CPU0:Sep 21 11:12:34.819 : config[65794]: %MGBL-CONFIG-6-DB_COMMIT :
Configuration committed by user 'root'. Use 'show configuration commit changes
1000000152' to view the changes.

RP/0/RSP0/CPU0:router(config-subif)# end

RP/0/RSP0/CPU0:Sep 21 11:12:35.633 : config[65794]: %MGBL-SYS-5-CONFIG_I : Configured
from console by root
RP/0/RSP0/CPU0:router#
```

The **show run** command displays the trunk interface first, then the subinterfaces in ascending numerical order.

```
RP/0/RSP0/CPU0:router# show run | begin GigabitEthernet0/5/0/0
Mon Sep 21 11:15:42.654 EDT
Building configuration...
interface GigabitEthernet0/5/0/0
 shutdown
 !
interface GigabitEthernet0/5/0/0.0
 encapsulation dot1q 100
 !
interface GigabitEthernet0/5/0/1
```

```
shutdown
!
```

When a subinterface is first created, the Cisco ASR 9000 Series Router recognizes it as an interface that, with few exceptions, is interchangeable with a trunk interface. After the new subinterface is configured further, the **show interface** command can display it along with its unique counters:

The following example shows the display output for the trunk interface, GigabitEthernet 0/5/0/0, followed by the display output for the subinterface GigabitEthernet 0/5/0/0.0.

```
RP/0/RSP0/CPU0:router# show interface gigabitEthernet 0/5/0/0
Mon Sep 21 11:12:51.068 EDT
GigabitEthernet0/5/0/0 is administratively down, line protocol is administratively
down
  Interface state transitions: 0
  Hardware is GigabitEthernet, address is 0024.f71b.0ca8 (bia 0024.f71b.0ca8)
  Internet address is Unknown
  MTU 1514 bytes, BW 1000000 Kbit
    reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation 802.1Q Virtual LAN,
  Full-duplex, 1000Mb/s, SFPD, 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 input never, output never
  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

RP/0/RSP0/CPU0:router# show interface gigabitEthernet0/5/0/0.0
Mon Sep 21 11:12:55.657 EDT
GigabitEthernet0/5/0/0.0 is administratively down, line protocol is administratively
down
  Interface state transitions: 0
  Hardware is VLAN sub-interface(s), address is 0024.f71b.0ca8
  Internet address is Unknown
  MTU 1518 bytes, BW 1000000 Kbit
    reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation 802.1Q Virtual LAN, VLAN Id 100, loopback not set,
  ARP type ARPA, ARP timeout 04:00:00
  Last input never, output never
  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 packets output, 0 bytes, 0 total output drops
  Output 0 broadcast packets, 0 multicast packets
```

The following example shows two interfaces being created at the same time: first, the bundle trunk interface, then a subinterface attached to the trunk:

```
RP/0/RSP0/CPU0:router# conf
Mon Sep 21 10:57:31.736 EDT
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether1
RP/0/RSP0/CPU0:router(config-if)# no shut
RP/0/RSP0/CPU0:router(config-if)# interface Bundle-Ether1.0
RP/0/RSP0/CPU0:router(config-subif)# encapsulation dot1q 100
RP/0/RSP0/CPU0:router(config-subif)# commit
RP/0/RSP0/CPU0:Sep 21 10:58:15.305 : config[65794]: %MGBL-CONFIG-6-DB_COMMIT : C
onfiguration committed by user 'root'. Use 'show configuration commit changes 10
00000149' to view the changes.
RP/0/RSP0/CPU0:router# show run | begin Bundle-Ether1
Mon Sep 21 10:59:31.317 EDT
Building configuration...
interface Bundle-Ether1
!
interface Bundle-Ether1.0
 encapsulation dot1q 100
!
```

You delete a subinterface using the **no interface** command.

```
RP/0/RSP0/CPU0:router#
RP/0/RSP0/CPU0:router# show run | begin GigabitEthernet0/5/0/0
Mon Sep 21 11:42:27.100 EDT
Building configuration...
interface GigabitEthernet0/5/0/0
 negotiation auto
!
interface GigabitEthernet0/5/0/0.0
 encapsulation dot1q 100
!
interface GigabitEthernet0/5/0/1
 shutdown
!
RP/0/RSP0/CPU0:router# conf
Mon Sep 21 11:42:32.374 EDT
RP/0/RSP0/CPU0:router(config)# no interface GigabitEthernet0/5/0/0.0
RP/0/RSP0/CPU0:router(config)# commit
RP/0/RSP0/CPU0:Sep 21 11:42:47.237 : config[65794]: %MGBL-CONFIG-6-DB_COMMIT :
Configuration committed by user 'root'. Use 'show configuration commit changes
1000000159' to view the changes.
RP/0/RSP0/CPU0:router(config)# end
RP/0/RSP0/CPU0:Sep 21 11:42:50.278 : config[65794]: %MGBL-SYS-5-CONFIG_I : Configured
from console by root
RP/0/RSP0/CPU0:router# show run | begin GigabitEthernet0/5/0/0
Mon Sep 21 11:42:57.262 EDT
Building configuration...
interface GigabitEthernet0/5/0/0
 negotiation auto
!
interface GigabitEthernet0/5/0/1
 shutdown
!
```

Layer 2, Layer 3, and EFP's

On the Cisco ASR 9000 Series Router, a trunk interface can be either a Layer 2 or Layer 3 interface. A Layer 2 interface is configured using the **interface** command with the **l2transport** keyword. When the **l2transport** keyword is not used, the interface is a Layer 3 interface. Subinterfaces are configured as Layer 2 or Layer 3 subinterface in the same way.

A Layer 3 trunk interface or subinterface is a routed interface and can be assigned an IP address. Traffic sent on that interface is routed.

A Layer 2 trunk interface or subinterface is a switched interface and cannot be assigned an IP address. A Layer 2 interface must be connected to an L2VPN component. Once it is connected, it is called an access connection.

Subinterfaces can only be created under a Layer 3 trunk interface. Subinterfaces cannot be created under a Layer 2 trunk interface.

A Layer 3 trunk interface can have any combination of Layer 2 and Layer 3 interfaces.

The following example shows an attempt to configure a subinterface under an Layer 2 trunk and the commit errors that occur. It also shows an attempt to change the Layer 2 trunk interface to an Layer 3 interface and the errors that occur because the interface already had an IP address assigned to it.

```
RP/0/RSP0/CPU0:router# config
Mon Sep 21 12:05:33.142 EDT
RP/0/RSP0/CPU0:router(config)# interface GigabitEthernet0/5/0/0
RP/0/RSP0/CPU0:router(config-if)# ipv4 address 10.0.0.1/24
RP/0/RSP0/CPU0:router(config-if)# commit
RP/0/RSP0/CPU0:Sep 21 12:05:57.824 : config[65794]: %MGBL-CONFIG-6-DB_COMMIT :
Configuration committed by user 'root'. Use 'show configuration commit changes
1000000160' to view the changes.
RP/0/RSP0/CPU0:router(config-if)# end
RP/0/RSP0/CPU0:Sep 21 12:06:01.890 : config[65794]: %MGBL-SYS-5-CONFIG_I : Configured
from console by root
RP/0/RSP0/CPU0:router# show run | begin GigabitEthernet0/5/0/0
Mon Sep 21 12:06:19.535 EDT
Building configuration...
interface GigabitEthernet0/5/0/0
  ipv4 address 10.0.0.1 255.255.255.0
  negotiation auto
!
interface GigabitEthernet0/5/0/1
  shutdown
!
RP/0/RSP0/CPU0:router#
RP/0/RSP0/CPU0:router#
RP/0/RSP0/CPU0:router# conf
Mon Sep 21 12:08:07.426 EDT
RP/0/RSP0/CPU0:router(config)# interface GigabitEthernet0/5/0/0 l2transport
RP/0/RSP0/CPU0:router(config-if-l2)# commit

% Failed to commit one or more configuration items during a pseudo-atomic operation.
All changes made have been reverted. Please issue 'show configuration failed' from
this session to view the errors
RP/0/RSP0/CPU0:router(config-if-l2)# no ipv4 address
RP/0/RSP0/CPU0:router(config-if)# commit
RP/0/RSP0/CPU0:Sep 21 12:08:33.686 : config[65794]: %MGBL-CONFIG-6-DB_COMMIT :
Configuration committed by user 'root'. Use 'show configuration commit changes
1000000161' to view the changes.
RP/0/RSP0/CPU0:router(config-if)# end
RP/0/RSP0/CPU0:Sep 21 12:08:38.726 : config[65794]: %MGBL-SYS-5-CONFIG_I : Configured
from console by root
RP/0/RSP0/CPU0:router#
```

```

RP/0/RSP0/CPU0:router# show run interface GigabitEthernet0/5/0/0
Mon Sep 21 12:09:02.471 EDT
interface GigabitEthernet0/5/0/0
  negotiation auto
  l2transport
!
!
RP/0/RSP0/CPU0:router#
RP/0/RSP0/CPU0:router# conf
Mon Sep 21 12:09:08.658 EDT
RP/0/RSP0/CPU0:router(config)# interface GigabitEthernet0/5/0/0.0
                                     ^
RP/0/RSP0/CPU0:router(config)# interface GigabitEthernet0/5/0/0.0
RP/0/RSP0/CPU0:router(config-subif)# commit

% Failed to commit one or more configuration items during a pseudo-atomic operation.
All changes made have been reverted. Please issue 'show configuration failed' from
this session to view the errors
RP/0/RSP0/CPU0:router(config-subif)#
RP/0/RSP0/CPU0:router(config-subif)# interface GigabitEthernet0/5/0/0
RP/0/RSP0/CPU0:router(config-if)# no l2transport
RP/0/RSP0/CPU0:router(config-if)# interface GigabitEthernet0/5/0/0.0
RP/0/RSP0/CPU0:router(config-subif)# encapsulation dot1q 99
RP/0/RSP0/CPU0:router(config-subif)# ipv4 address 11.0.0.1/24
RP/0/RSP0/CPU0:router(config-subif)# interface GigabitEthernet0/5/0/0.1 l2transport
RP/0/RSP0/CPU0:router(config-subif)# encapsulation dot1q 700
RP/0/RSP0/CPU0:router(config-subif)# commit
RP/0/RSP0/CPU0:Sep 21 12:11:45.896 : config[65794]: %MGBL-CONFIG-6-DB_COMMIT :
Configuration committed by user 'root'. Use 'show configuration commit changes
1000000162' to view the changes.
RP/0/RSP0/CPU0:router(config-subif)# end
RP/0/RSP0/CPU0:Sep 21 12:11:50.133 : config[65794]: %MGBL-SYS-5-CONFIG_I : Configured
from console by root
RP/0/RSP0/CPU0:router#
RP/0/RSP0/CPU0:router# show run | b GigabitEthernet0/5/0/0
Mon Sep 21 12:12:00.248 EDT
Building configuration...
interface GigabitEthernet0/5/0/0
  negotiation auto
!
interface GigabitEthernet0/5/0/0.0
  ipv4 address 11.0.0.1 255.255.255.0
  encapsulation dot1q 99
!
interface GigabitEthernet0/5/0/0.1 l2transport
  encapsulation dot1q 700
!
interface GigabitEthernet0/5/0/1
  shutdown
!

```

All subinterfaces must have unique encapsulation statements, so that the router can send incoming packets and frames to the correct subinterface. If a subinterface does not have an encapsulation statement, the router will not send any traffic to it.

In Cisco IOS XR, an Ethernet Flow Point (EFP) is implemented as a Layer 2 subinterface, and consequently, a Layer 2 subinterface is often called an EFP. For more information about EFPs, see the [Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Configuration Guide](#).

A Layer 2 trunk interface can be used as an access connection. However, a Layer 2 trunk interface is not an EFP because an EFP, by definition, is a substream of an overall stream of traffic.

Cisco IOS XR also has other restrictions on what can be configured as a Layer 2 or Layer 3 interface. Certain configuration blocks only accept Layer 3 and not Layer 2. For example, OSPF only accepts Layer 3 trunks and subinterface. Refer to the appropriate Cisco IOS XR configuration guide for other restrictions.

Enhanced Performance Monitoring for Layer 2 Subinterfaces (EFPs)

Beginning in Cisco IOS XR Release 4.0.1, the Cisco ASR 9000 Series Router adds support for basic counters for performance monitoring on Layer 2 subinterfaces.

This section provides a summary of the new support for Layer 2 interface counters. For information about how to configure Performance Monitoring, see the “[Implementing Performance Management](#)” chapter of the *Cisco ASR 9000 Series Aggregation Services Router System Monitoring Configuration Guide*.

The **interface basic-counters** keyword has been added to support a new entity for performance statistics collection and display on Layer 2 interfaces in the following commands:

- **performance-mgmt statistics interface basic-counters**
- **performance-mgmt threshold interface basic-counters**
- **performance-mgmt apply statistics interface basic-counters**
- **performance-mgmt apply threshold interface basic-counters**
- **performance-mgmt apply monitor interface basic-counters**
- **show performance-mgmt monitor interface basic-counters**
- **show performance-mgmt statistics interface basic-counters**

The **performance-mgmt threshold interface basic-counters** command supports the following attribute values for Layer 2 statistics, which also appear in the **show performance-mgmt statistics interface basic-counters** and **show performance-mgmt monitor interface basic-counters** command:

Attribute	Description
InOctets	Bytes received (64-bit)
InPackets	Packets received (64-bit)
InputQueueDrops	Input queue drops (64-bit)
InputTotalDrops	Inbound correct packets discarded (64-bit)
InputTotalErrors	Inbound incorrect packets discarded (64-bit)
OutOctets	Bytes sent (64-bit)
OutPackets	Packets sent (64-bit)
OutputQueueDrops	Output queue drops (64-bit)
OutputTotalDrops	Outband correct packets discarded (64-bit)
OutputTotalErrors	Outband incorrect packets discarded (64-bit)

Other Performance Management Enhancements

The following additional performance management enhancements are included in Cisco IOS XR Release 4.0.1:

- You can retain performance management history statistics across a process restart or route processor (RP) failover using the new **history-persistent** keyword option for the **performance-mgmt statistics interface** command.
- You can save performance management statistics to a local file using the **performance-mgmt resources dump local** command.
- You can filter performance management instances by defining a regular expression group (**performance-mgmt regular-expression** command), which includes multiple regular expression indices that specify strings to match. You apply a defined regular expression group to one or more statistics or threshold templates in the **performance-mgmt statistics interface** or **performance-mgmt thresholds** interface commands.

Frequency Synchronization and SyncE

Cisco IOS XR Release 3.9 introduces support for SyncE-capable Ethernet on the Cisco ASR 9000 Series Router. Frequency Synchronization provides the ability to distribute precision clock signals around the network. Highly accurate timing signals are initially injected into the Cisco ASR 9000 router in the network from an external timing technology (such as Cesium atomic clocks, or GPS), and used to clock the router's physical interfaces. Peer routers can then recover this precision frequency from the line, and also transfer it around the network. This feature is traditionally applicable to SONET/SDH networks, but with Cisco IOS XR Release 3.9, is now provided over Ethernet for Cisco ASR 9000 Series Aggregation Services Routers with Synchronous Ethernet capability.

```
interface <intf>
  <frequency synchronization config>

controller <sonet controller>
  <frequency synchronization config>

clock-interface sync <port-num> location <node>
  <additional PD commands>
  <frequency synchronization config>
```

Where <frequency synchronization config> expands to:

```
frequency synchronization
  selection input
  ssm disable
  priority <pri>
  quality transmit { lowest <q1 option> <q1> [ highest <q1> ] |
                    highest <q1 option> <q1> |
                    exact <q1 option> <q1> }
  quality receive { lowest <q1 option> <q1> [ highest <q1> ] |
                   highest <q1 option> <q1> |
                   exact <q1 option> <q1> }
  wait-to-restore <time>
  <additional PD commands>
```

Where:

```
<q1 option> = itu-t option { 1 | 2 generation { 1 | 2 } }
frequency synchronization
  clock-interface { independent | system }
  quality itu-t option { 1 | 2 generation { 1 | 2 } }
  log selection { changes | errors }
  <additional PD commands>
```

Synchronous Ethernet is the ability to provide PHY-level frequency distribution through an Ethernet port. Previously, SDH and SONET devices were used in conjunction with external timing technology (primary reference clock [PRC] or primary reference source [PRS] using Cesium oscillators and / or global positioning system [GPS] as the clock source) to provide accurate and stable frequency reference. Using similar external references as a source, SyncE, natively supported on the Cisco ASR 9000 Series Routers, aims to achieve the same function.

How to Configure Ethernet

This section provides the following configuration procedures:

- [Configuring Ethernet Interfaces, page 37](#)
- [Configuring Frequency Synchronization and SyncE, page 42](#)

Configuring Ethernet Interfaces

This section provides the following configuration procedures:

- [Configuring Gigabit Ethernet Interfaces, page 37](#)
- [Configuring a L2VPN Ethernet Port, page 40](#)

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 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	<p>show version</p> <p>Example: RP/0/RSP0/CPU0:router# show version</p>	(Optional) Displays the current software version, and can also be used to confirm that the router recognizes the modular services card.
Step 2	<p>show interfaces [GigabitEthernet TenGigE] <i>interface-path-id</i></p> <p>Example: RP/0/RSP0/CPU0:router# show interface TenGigE 0/1/0/0</p>	<p>(Optional) Displays the configured interface and checks the status of each interface port.</p> <p>Possible interface types for this procedure are:</p> <ul style="list-style-type: none"> • GigabitEthernet • TenGigE
Step 3	<p>configure</p> <p>Example: RP/0/RSP0/CPU0:router# configure terminal</p>	Enters global configuration mode.
Step 4	<p>interface [GigabitEthernet TenGigE] <i>interface-path-id</i></p> <p>Example: RP/0/RSP0/CPU0:router(config)# interface TenGigE 0/1/0/0</p>	<p>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:</p> <ul style="list-style-type: none"> • GigabitEthernet • TenGigE <p>Note The example indicates an 8-port 10-Gigabit Ethernet interface in modular services card slot 1.</p>
Step 5	<p>ipv4 address <i>ip-address mask</i></p> <p>Example: RP/0/RSP0/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224</p>	<p>Assigns an IP address and subnet mask to the interface.</p> <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.

	Command or Action	Purpose
Step 6	<p>flow-control {bidirectional egress ingress}</p> <p>Example: RP/0/RSP0/CPU0:router(config-if)# flow control ingress</p>	<p>(Optional) Enables the sending and processing of flow control pause frames.</p> <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	<p>mtu <i>bytes</i></p> <p>Example: RP/0/RSP0/CPU0:router(config-if)# mtu 1448</p>	<p>(Optional) Sets the MTU value for the interface.</p> <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.
Step 8	<p>mac-address <i>value1.value2.value3</i></p> <p>Example: RP/0/RSP0/CPU0:router(config-if)# mac address 0001.2468.ABCD</p>	<p>(Optional) Sets the MAC layer address of the Management Ethernet interface.</p> <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	<p>negotiation auto</p> <p>Example: RP/0/RSP0/CPU0:router(config-if)# negotiation auto</p>	<p>(Optional) Enables autonegotiation on a Gigabit Ethernet interface.</p> <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. <p>Note The negotiation auto command is available on Gigabit Ethernet interfaces only.</p>
Step 10	<p>no shutdown</p> <p>Example: RP/0/RSP0/CPU0:router(config-if)# no shutdown</p>	<p>Removes the shutdown configuration, which forces an interface administratively down.</p>

	Command or Action	Purpose
Step 11	<pre>end or commit</pre> <p>Example:</p> <pre>RP/0/RSP0/CPU0:router(config-if)# end or RP/0/RSP0/CPU0:router(config-if)# commit</pre>	<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 12	<pre>show interfaces [GigabitEthernet TenGigE] interface-path-id</pre> <p>Example:</p> <pre>RP/0/RSP0/CPU0:router# show interfaces TenGigE 0/3/0/0</pre>	<p>(Optional) Displays statistics for interfaces on the router.</p>

What to Do Next

- 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 ASR 9000 Series Router configuration guide.

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

- configure
- interface [GigabitEthernet | TenGigE] *interface-path-id*
- l2transport
- l2protocol cpsv { tunnel | reverse-tunnel }

5. **end**
or
commit
6. **show interfaces [GigabitEthernet | TenGigE] interface-path-id**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/RSP0/CPU0:router#	Enters global configuration mode.
Step 2	interface [GigabitEthernet TenGigE] <i>interface-path-id</i> Example: RP/0/RSP0/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/RSP0/CPU0:router(config-if)# l2transport	Enables Layer 2 transport mode on a port and enter Layer 2 transport configuration mode.
Step 4	l2protocol cpsv {tunnel reverse-tunnel} Example: RP/0/RSP0/CPU0:router(config-if-l2)# l2protocol cpsv tunnel	Configures Layer 2 protocol tunneling and protocol data unit (PDU) filtering on an Ethernet interface for the following protocols: CDP, PVST+, STP, VTP, where: <ul style="list-style-type: none"> • tunnel—Specifies L2PT encapsulation on frames as they enter the interface, and de-encapsulation on frames as they exit they interface. • reverse-tunnel—Specifies L2PT encapsulation on frames as they exit the interface, and de-encapsulation on frames as they enter the interface.

	Command or Action	Purpose
Step 5	<pre>end or commit</pre> <p>Example: RP/0/RSP0/CPU0:router(config-if-12)# end OR RP/0/RSP0/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: <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 6	<pre>show interfaces [GigabitEthernet TenGigE] interface-path-id</pre> <p>Example: RP/0/RSP0/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, refer to these documents:

- Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Configuration Guide*
- Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Command Reference*

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.

Configuring Frequency Synchronization and SyncE

This section describes how to configure the Frequency Synchronization and SyncE feature on the Cisco ASR 9000 Series Aggregation Services Routers. It includes the following topics:

- [Global Configuration, page 43](#)
- [Line Interface Configuration, page 44](#)

Global Configuration

Use the following procedure to set up the frequency synchronization feature globally.

SUMMARY STEPS

1. **configure**
2. **frequency synchronization**
3. **end**
or
commit

Command	Purpose
configure Example: RP/0/RSP0/CPU0:router# configure	Enters global configuration mode.
frequency synchronization Example: RP/0/RSP0/CPU0:ios(config)# frequency synchronization	Enables frequency synchronization for all interfaces.
end or commit Example: RP/0/RSP0/CPU0:router(config-freqsync)# end or RP/0/RSP0/CPU0:router(config-freqsync)# commit	Saves configuration changes. <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.

Line Interface Configuration

Use the following procedure to create a basic Gigabit Ethernet or 10-Gigabit Ethernet interface configuration and enable the frequency synchronization feature on the configured line interface.

SUMMARY STEPS

1. **configure**
2. **interface** [**GigabitEthernet** | **TenGigE**] *interface-path-id*
3. **frequency synchronization**
4. **end**
or
commit

Command	Purpose
configure Example: RP/0/RSP0/CPU0:router# configure	Enters global configuration mode.
interface GigabitEthernet 0/2/0/0 Example: RP/0/RSP0/CPU0:ios(config)## interface GigabitEthernet 0/2/0/0	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 a Gigabit Ethernet interface in modular services card slot 2.

Command	Purpose
frequency synchronization Example: RP/0/RSP0/CPU0:ios(config-if)# frequency synchronization	Enables frequency synchronization for all interfaces.
end OR commit Example: RP/0/RSP0/CPU0:router(config-freqsync)# end OR RP/0/RSP0/CPU0:router(config-freqsync)# commit	Saves configuration changes. <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.

Configuration Examples for Ethernet

This section provides the following configuration examples:

- [Configuring an Ethernet Interface: Example, page 45](#)
- [Configuring a Layer 2 VPN AC: Example, page 46](#)
- [Clock Interface Configuration: Example, page 46](#)
- [Enabling an Interface for Frequency Synchronization: Example, page 46](#)

Configuring an Ethernet Interface: Example

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

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface TenGigE 0/0/0/1
RP/0/RSP0/CPU0:router(config-if)# ipv4 address 172.18.189.38 255.255.255.224
RP/0/RSP0/CPU0:router(config-if)# flow-control ingress
```

```

RP/0/RSP0/CPU0:router(config-if)# mtu 1448
RP/0/RSP0/CPU0:router(config-if)# mac-address 0001.2468.ABCD
RP/0/RSP0/CPU0:router(config-if)# no shutdown
RP/0/RSP0/CPU0:router(config-if)# end
Uncommitted changes found, commit them? [yes]: yes

RP/0/RSP0/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 a Layer 2 VPN AC: Example

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

```

RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface TenGigE 0/0/0/2
RP/0/RSP0/CPU0:router(config-if)# l2transport
RP/0/RSP0/CPU0:router(config-if-l2)# l2protocol cpsv tunnel
RP/0/RSP0/CPU0:router(config-if-l2)# commit

```

Clock Interface Configuration: Example

```

RP/0/0/CPU0:ios#conf
RP/0/0/CPU0:ios(config)#clock-interface sync 0 location 0/0/CPU0
RP/0/0/CPU0:ios(config-clock-if)#frequency synchronization
RP/0/0/CPU0:ios(config-clk-freqsync)#selection input
RP/0/0/CPU0:ios(config-clk-freqsync)#commit

```

Enabling an Interface for Frequency Synchronization: Example

```

ios#conf
ios(config)#frequency synchronization
ios(config-freqsync)#commit
ios(config-freqsync)#exit
ios(config)#controller sonet 0/1/0/1
ios(config-sonet)#frequency synchronization

```

```
ios(config-sonet-freqsync)#wait-to-restore 0
ios(config-sonet-freqsync)#selection input
ios(config-sonet-freqsync)#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 the Cisco ASR 9000 Series Router](#) 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

The following sections provide references related to implementing Gigabit and 10-Gigabit Ethernet interfaces.

Related Documents

Related Topic	Document Title
Ethernet L2VPN	<i>Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Configuration Guide</i> <i>Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services 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://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