Configuring Ethernet Interfaces

This chapter provides information about configuring the Gigabit Ethernet interface modules. For more information about the commands used in this chapter, see the Cisco IOS XE 3S Command References.

- Configuring Ethernet Interfaces, on page 1
- Verifying the Interface Configuration, on page 13
- Verifying Interface Module Status, on page 14
- Configuring LAN/WAN-PHY Controllers, on page 15
- Configuration Examples, on page 21

Limitations and Restrictions

- Interface module A900-IMA8Z in slot 0 with A900-RSP3C-200-S supports a maximum of 6 ports at 10GE speed and needs explicit enablement using the `hw-module subslot 0/0 A900-IMA8Z mode 6-port` command.

- VRF-Aware Software Infrastructure (VASI) interface commands `interface vasileft` and `interface vasiright` are not supported starting Cisco IOS XE Release 3.15.

- Interface modules have slot restrictions, see ASR 900 Series Hardware Installation Guides

- MPLS MTU is not supported on releases prior to Cisco IOS XE Release 3.10.2 on the router. This is not applicable for Cisco IOS XE Everest 16.5.1.

- IP MTU and MPLS MTU are supported. But MPLS MTU support is restricted only to CPU originated traffic. For the forwarded traffic, it is the IP MTU that decides the behavior.

- On the RSP3 module, MTU value configured for a BDI interface should match with the MTU configuration for all the physical interfaces, which have a service instance associated with this BDI.

- To replace the configured interface module with a different interface module in a particular slot, run the `hw-module subslot slot-num default` command.
• Only A900-IMA8Z Interface Modules support LAN/WAN-PHY mode on the Cisco ASR 900 RSP3 Module.
• SNMP support is not available for WAN-PHY in Cisco IOS XE Release 3.18.1SP.
• IEEE 1588 and SyncE are not supported in the WAN-PHY mode on A900-IMA8Z Interface Modules.
• Giant counters are not supported.
• Mixed configurations of features are not supported on the same port. For example, one OC-3 port can have only CEM (CESoP or SAToP), ATM, IMA or DS3 configurations, but not a combination of these features on a single port.
• Ingress counters are not incremented for packets of the below packet format on the RSP3 module for the 10 Gigabit Ethernet interfaces, 100 Gigabit Ethernet interfaces, and 40 Gigabit Ethernet interfaces:
  MAC header---->Vlan header---->Length/Type
  When these packets are received on the RSP3 module, the packets are not dropped, but the counters are not incremented.
• If the IM is shutdown using `hw-module subslot shutdown` command, then the IM goes out-of-service. You should perform a Stateful Switchover (SSO) in the interim, as the IM needs to be re-inserted for successful reactivation.
• Following are some of the IMs that are not supported on certain slots when IPsec license is enabled:
  • The below IMs are not supported on the Slot 11 on the Cisco ASR 907 router:
    • SPA_TYPE_ETHER_IM_8x10GE
    • SPA_TYPE_ETHER_IM_2x40GE
  • The below IMs are not supported on the Slot 2 on the Cisco ASR 903 router for RSP3-200 and RSP3-400:
    • SPA_TYPE_ETHER_IM_8xGE_SFP_1x10GE
    • SPA_TYPE_ETHER_IM_8xGE_CU_1x10GE
    • SPA_TYPE_ETHER_IM_1x10GE
    • SPA_TYPE_ETHER_IM_8x10GE
    • SPA_TYPE_OCX_IM_OC3OC12
    • SPA_TYPE_ETHER_IM_8xGE_SFP
    • SPA_TYPE_ETHER_IM_8xGE_CU

### Configuring an Interface

This section lists the required configuration steps to configure Gigabit and Ten Gigabit Ethernet interface modules.
### Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>Do one of the following:</td>
<td>Specifies the Gigabit Ethernet or Ten Gigabit Ethernet interface to</td>
</tr>
<tr>
<td></td>
<td>• interface gigabitethernet slot/subslot/port</td>
<td>configure and enters interface configuration mode, where:</td>
</tr>
<tr>
<td></td>
<td>• interface tengigabitethernet slot/subslot/port</td>
<td>Note: The slot number is always 0.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config)# interface gigabitethernet 0/0/1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config)# interface tengigabitethernet 0/0/1</td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>ip address ip-address mask {secondary}</td>
<td>dhcp {client-id interface-name} {hostname host-name}</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-if)# ip address 192.168.1.1 255.255.255.255 dhcp hostname host1</td>
<td>If this keyword is omitted, the configured address is the primary IP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>address. If this keyword is omitted, the configured address is the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>primary IP address.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ip-address — The IP address for the interface.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• mask — The mask for the associated IP subnet.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• secondary—(Optional) Specifies that the configured address is a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>secondary IP address. If this keyword is omitted, the configured</td>
</tr>
<tr>
<td></td>
<td></td>
<td>address is the primary IP address.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• dhcp—Specifies that IP addresses will be assigned dynamically using</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DHCP.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• client-id interface-name—Specifies the client identifier. The</td>
</tr>
<tr>
<td></td>
<td></td>
<td>interface-name sets the client identifier to the hexadecimal MAC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>address of the named interface.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• hostname host-name—Specifies the hostname for the DHCP purposes. The</td>
</tr>
<tr>
<td></td>
<td></td>
<td>host-name is the name of the host to be placed in the DHCP option 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>field.</td>
</tr>
<tr>
<td>Step 4</td>
<td>no negotiation auto</td>
<td>(Optional) Disables automatic negotiation.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td>Note: Use the speed command only when the mode is set to no negotiation</td>
</tr>
<tr>
<td></td>
<td>Router(config-if)# no negotiation auto</td>
<td>auto.</td>
</tr>
</tbody>
</table>
### Purpose

**Step 5**  
**Command or Action**: `speed {10 | 100 | 1000}`  
(Optional) Specifies the speed for an interface to transmit at 10, 100, and 1000 Mbps (1 Gbps), where the default is 1000 Mbps.  
**Example:**  
```
Router(config-if)# speed 1000
```

**Step 6**  
**Command or Action**: `mtu bytes`  
(As Required) Specifies the maximum packet size for an interface, where:  
- `bytes`: The maximum number of bytes for a packet.  
**Example:**  
```
Router(config-if)# mtu 1500
```

**Step 7**  
**Command or Action**: `standby [group-number] ip [ip-address [secondary]]`  
Creates or enables the Hot Standby Router Protocol (HSRP) group using its number and virtual IP address, where:  
- (Optional) `group-number`: The group number on the interface for which HSRP is being enabled. The range is from 0 to 255; the default is 0. If there is only one HSRP group, you do not need to enter a group number.  
- (Optional on all but one interface if configuring HSRP) `ip-address`: The virtual IP address of the hot standby router interface. You must enter the virtual IP address for at least one of the interfaces; it can be learned on the other interfaces.  
- (Optional) `secondary`: Specifies that the IP address is a secondary hot standby router interface. If neither router is designated as a secondary or standby router and no priorities are set, the primary IP addresses are compared and the higher IP address is the active router, with the next highest as the standby router.  
**Example:**  
```
Router(config-if)# standby 250 ip 192.168.10.1
```

**Step 8**  
**Command or Action**: `no shutdown`  
Enables the interface.  
**Example:**  
```
Router(config-if)# no shutdown
```

### Notes

- **Note**: This command is required only for configurations that use HSRP.  
- **Note**: This command enables HSRP but does not configure it further.
Specifying the Interface Address on an Interface Module

To configure or monitor Ethernet interfaces, you need to specify the physical location of the interface module and interface in the CLI. The interface address format is slot/subslot/port, where:

- **slot**—The chassis slot number in the chassis where the interface module is installed.
- **subslot**—The subslot where the interface module is installed. Interface module subslots are numbered from 0 to 5 for ASR 903 and from 0 to 15 for ASR 907, from bottom to top.
- **port**—The number of the individual interface port on an interface module.

The following example shows how to specify the first interface (0) on an interface module installed in the first interface module slot:

```
Router(config)# interface GigabitEthernet 0/0/0
no ip address
shutdown
negotiation auto
no cdp enable
```

Note

The interface module slot number is always 0.

```
• subslot—The subslot where the interface module is installed. Interface module subslots are numbered from 0 to 5 for ASR 903 and from 0 to 15 for ASR 907, from bottom to top.
• port—The number of the individual interface port on an interface module.
```

Configuring Hot Standby Router Protocol

Hot Standby Router Protocol (HSRP) provides high network availability because it routes IP traffic from hosts without relying on the availability of any single router. You can deploy HSRP in a group of routers to select an active router and a standby router. (An *active* router is the router of choice for routing packets; a *standby* router is a router that takes over the routing duties when an active router fails, or when preset conditions are met).

HSRP is enabled on an interface by entering the `standby [group-number] ip [ip-address [secondary]]` command. The `standby` command is also used to configure various HSRP elements. This document does not discuss more complex HSRP configurations. For additional information on configuring HSRP, see the HSRP section of the Cisco IP Configuration Guide publication that corresponds to your Cisco IOS XE software release. In the following HSRP configuration, standby group 2 on Gigabit Ethernet port 0/1/0 is configured at a priority of 110 and is also configured to have a preemptive delay should a switchover to this port occur:

```
Router(config)# interface GigabitEthernet 0/1/0
Router(config-if)# standby 2 ip 192.168.1.200
Router(config-if)# standby 2 priority 110
Router(config-if)# standby 2 preempt
```

The maximum number of different HSRP groups that can be created on one physical interface is 4. If additional groups are required, create 4 groups on the physical interface, and the remaining groups on the BDI or on another physical interface.

The maximum number of HSRP or VRRP groups allowed are:

- **RSP1A** —128 HSRP or VRRP groups. 128 HSRP or VRRP groups restriction implies that the maximum number of different interfaces that can be configured with VRRP or HSRP is 128. You cannot configure HSRP or VRRP for more than 128 interfaces but you can configure up to 256 HSRP or VRRP groups in those 128 interfaces.
- **RSP1B** —256 HSRP or VRRP groups
Verifying HSRP

To verify the HSRP information, use the show standby command in EXEC mode:

```
Router# show standby
Ethernet0 - Group 0
Local state is Active, priority 100, may preempt
Hellotime 3 holdtime 10
Next hello sent in 0:00:00
Hot standby IP address is 198.92.72.29 configured
Active router is local
Standby router is 198.92.72.21 expires in 0:00:07
Standby virtual mac address is 0000.0c07.ac00
Tracking interface states for 2 interfaces, 2 up:
UpSerial0
UpSerial1
```

Modifying the Interface MTU Size

The maximum number of unique MTU values that can be configured on the physical interfaces on the chassis is 8. Use the `show platform hardware pp active interface mtu command` to check the number of values currently configured on the router. This is not applicable on Cisco ASR 900 RSP3 Module.

The Cisco IOS software supports three different types of configurable maximum transmission unit (MTU) options at different levels of the protocol stack:

- **Interface MTU**—The interface module checks the MTU value of incoming traffic. Different interface types support different interface MTU sizes and defaults. The interface MTU defines the maximum packet size allowable (in bytes) for an interface before drops occur. If the frame is smaller than the interface MTU size, but is not smaller than the minimum frame size for the interface type (such as 64 bytes for Ethernet), then the frame continues to process.

- **IP MTU**—Can be specified on an interface. If an IP packet exceeds the IP MTU size, then the packet is fragmented.
When the value of the IP MTU is 9216 bytes and the packet is sent with 9214 bytes, 18 bytes are added to the packet by FPGA. The total size of the packet then becomes 9232 bytes. The maximum supported MTU of the packet without fragmentation in ASIC is 9232, so there is no traffic loss with a packet size of 9214. When IP MTU is 9216, and the packet is sent with either 9215 or 9216 bytes, 18 bytes are added to the packet by FPGA. The total size of the packet then becomes 9233 or 9234 bytes respectively. As the packet size exceeds the maximum supported MTU size of the packet without fragmentation, the packet is dropped.

When the traffic with packet size greater than 9216 bytes is sent and the MTU is configured as 9216 bytes, the packet is fragmented. Hence, the packet loss is prevented.

Note

The IP MTU configured on BDI should not be greater than the Layer2 MTU configured on the underlying Layer2 interface. For Cisco ASR 900 RSP3 Module the IP MTU configured on a BDI should be equal to the Layer2 MTU configured on the underlying Layer2 interface.

• MPLS MTU—If the MPLS MTU is set to a value, for example, 1500 bytes, the value is programmed as 1504 bytes at the hardware level to allow the addition of one label. Consider the case of pseudowire. If the packet size of Layer 2 traffic sent with four bytes of Frame Check Sequence (FCS) to the pseudowire is 1500 bytes, then and four bytes of pseudowire control word and one pseudowire label (label size is four bytes) is added to the packet, the packet size is now 1508 bytes with FCS. However, note that while calculating the packet size, FCS is not considered. So the calculated packet size is 1504 bytes, which is equal to the MPLS MTU programmed in the hardware. This packet is forwarded as expected.

However, if another label is added to this packet, the packet size becomes 1508 bytes without FCS. This value is greater than programmed MTU value, so this packet is dropped. This restriction applies not only to pseudowire, but to the entire MPLS network.

To ensure that packets are not dropped, MPLS MTUs should be set considering the maximum size of the label stack that is added to the packet in the network.

Encapsulation methods and MPLS MTU labels add additional overhead to a packet. For example, Subnetwork Access Protocol (SNAP) encapsulation adds an 8-byte header, dot1q encapsulation adds a 2-byte header, and each MPLS label adds a 4-byte header (n labels x 4 bytes).

For the Gigabit Ethernet interface module on the chassis, the default MTU size is 1500 bytes. The maximum configurable MTU is 9216 bytes. The interface module automatically adds an additional 22 bytes to the configured MTU size to accommodate some of the additional overhead.

Interface MTU Configuration Guidelines

When configuring the interface MTU size, consider the following guidelines:

• The default interface MTU size accommodates a 1500-byte packet, plus 22 additional bytes to cover the following additional overhead:
  • Layer 2 header—14 bytes
  • Dot1q header—4 bytes
  • CRC—4 bytes
If you are using MPLS, ensure that the `mpls mtu` command is configured for a value less than or equal to the interface MTU. This is not applicable for Cisco ASR 900 RSP3 Module.

- If you are using MPLS labels, then you should increase the default interface MTU size to accommodate the number of MPLS labels. Each MPLS label adds 4 bytes of overhead to a packet.
- Interface MTU is not supported on BDI Interface

### Configuring Interface MTU

To modify the MTU size on an interface, use the following command in interface configuration mode:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>mtu bytes</code></td>
<td>Configures the maximum packet size for an interface, where:</td>
</tr>
<tr>
<td>Router(config-if)# mtu bytes</td>
<td>- <code>bytes</code>— Specifies the maximum number of bytes for a packet.</td>
</tr>
<tr>
<td></td>
<td>The default is 1500 bytes and the maximum configurable MTU is 9216 bytes.</td>
</tr>
</tbody>
</table>

To return to the default MTU size, use the `no` form of the command.

---

When IP FRR over BDI is configured, the maximum allowed packet size is 1504 bytes.

When the BGP-PIC core is enabled, a packet destined to a prefix that is learnt through eBGP, is dropped if the packet size is greater than 1504 bytes. To work around this limitation, do one of the following:

- Disable the BGP-PIC core,
- Use the static route, or
- Use routed-port instead of BDI.

### Verifying the MTU Size

To verify the MTU size for an interface, use the `show interfaces gigabitethernet` privileged EXEC command and observe the value shown in the “MTU” field.

The following example shows an MTU size of 1500 bytes for interface port 0 (the second port) on the Gigabit Ethernet interface module installed in slot 1:

```
Router# show interfaces gigabitethernet 0/1/0
GigabitEthernet0/1/0 is up, line protocol is up
  Hardware is A900-IMA8T , address is d0c2.8216.0590 (bia d0c2.8216.0590)
  MTU 1500 bytes
, BW 1000000 Kbit/sec, DLY 10 usec,
  reliability 255/255, txload 1/255, rxload 22/255
```
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)

MPLS MTU

MPLS MTU configuration is supported starting with Cisco IOS XE Release 3.10.2 and later. The `platform mpls mtu-enable` command is introduced to enable MPLS MTU on the router.

Restrictions

- MPLS MTU is not supported if IP address is not configured on the interface.
- MPLS MTU is not supported with MPLS LDP Auto configuration.
- MPLS MTU is not supported with BGP send-label.
- IP MTU configuration on an interface does not program MPLS MTU in the hardware. MPLS MTU value is obtained from the Interface MTU or IP MTU.
- In releases prior to Cisco IOS XE Release 3.10.2, if IP MTU is changed, MPLS MTU also changes.
- If both Interface MTU and IP MTU are configured MPLS MTU is obtained from IP MTU. See Table 1: MTU Normal Behavior (Command Not Enabled), on page 9.

<table>
<thead>
<tr>
<th>Interface-MTU</th>
<th>IP MTU</th>
<th>MPLS MTU</th>
<th>MPLS MTU Value Derived</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Interface MTU</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>IP MTU</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>IP MTU</td>
</tr>
</tbody>
</table>

- If MPLS MTU is enabled using `platform mpls mtu-enable` command, then IP MTU does not affect the MPLS MTU configuration. See Table 2: MTU Behavior with platform mpls mtu-enable Command Configured, on page 9.

<table>
<thead>
<tr>
<th>Interface MTU</th>
<th>IP MTU</th>
<th>MPLS MTU</th>
<th>MPLS MTU Value Derived</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Interface MTU</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Default value</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Interface MTU</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Default value</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>MPLS MTU</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>MPLS MTU</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>MPLS MTU</td>
</tr>
</tbody>
</table>
### Configuring MPLS MTU Globally

We recommend not to toggle the command as inconsistent results may be displayed.

**Note**

After configuring or unconfiguring the command, we recommend that all MTU values on all the interfaces are re-configured.

#### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Configures MPLS MTU globally on the router</td>
</tr>
<tr>
<td><strong>platform mpls mtu-enable</strong></td>
<td>Example: <code>Router (config)# platform mpls mtu-enable</code></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Specifies the Gigabit Ethernet or Ten Gigabit Ethernet interface to configure and enters interface configuration mode, where:</td>
</tr>
<tr>
<td><strong>interface gigabitethernet slot/subslot/port</strong></td>
<td>Example: <code>Router (config)# interface GigabitEthernet 0/0/1</code></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Configures the MTU value.</td>
</tr>
<tr>
<td><strong>mpls mtu mtu-value</strong></td>
<td>Example: <code>Router(config-if)# mpls mtu 700</code></td>
</tr>
</tbody>
</table>

#### Verifying MPLS MTU

Use the `show platform hardware pp active feature mpls mtu-table` command to display the MPLS MTU values configured on the router.

```
Router# show platform hardware pp active feature mpls mtu-table
MPLS MTU Table
Index  MTU  Ref-Count
------------------------
0      1504  1
1      704   0
2      0     0
```
Configuring the Encapsulation Type

The only encapsulation supported by the interface modules is IEEE 802.1Q encapsulation for virtual LANs (VLANs).

Note

VLANs are only supported on Ethernet Virtual Connection (EVC) service instances and Trunk Ethernet Flow Point (EFP) interfaces.

For more information about how to configure these features, see the Configuring Ethernet Virtual Connections on the Cisco ASR 900 Series Router document.

Configuring Autonegotiation on an Interface

Gigabit Ethernet interfaces use a connection-setup algorithm called autonegotiation. Autonegotiation allows the local and remote devices to configure compatible settings for communication over the link. Using autonegotiation, each device advertises its transmission capabilities and then agrees upon the settings to be used for the link.

For the Gigabit Ethernet interfaces on the chassis, flow control is autonegotiated when autonegotiation is enabled. Autonegotiation is enabled by default.

The Copper SFP does not auto-negotiate full duplex with 8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8X1GE) with speed 100 configured.

When enabling autonegotiation, consider these guidelines:

- If autonegotiation is disabled on one end of a link, it must be disabled on the other end of the link. If one end of a link has autonegotiation disabled while the other end of the link does not, the link will not come up properly on both ends.
- Flow control is enabled by default.
- Flow control will be on if autonegotiation is disabled on both ends of the link.

Enabling Autonegotiation

To enable autonegotiation on a Gigabit Ethernet interface, use the following command in interface configuration mode:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>negotiation auto</td>
<td>Enables autonegotiation on a Gigabit Ethernet interface. Advertisement of flow control occurs.</td>
</tr>
</tbody>
</table>

Router(config-if)# negotiation auto
Disabling Autonegotiation

Autonegotiation is automatically enabled and can be disabled on Gigabit Ethernet interfaces. During autonegotiation, advertisement for flow control, speed, and duplex occurs, depending on the media (fiber or copper) in use.

Speed and duplex configurations can be advertised using autonegotiation. The values that are negotiated are:

- For Gigabit Ethernet interfaces using RJ-45 ports and for Copper (Cu) SFP ports—10, 100, and 1000 Mbps for speed and full-duplex mode. Link speed is not negotiated when using fiber interfaces.

To disable autonegotiation, use the following command in interface configuration mode:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>no negotiation auto</td>
<td>Disables autonegotiation on Gigabit Ethernet interfaces. No advertisement of flow control occurs.</td>
</tr>
</tbody>
</table>

```
Router(config-if)# no negotiation auto
```

Configuring Carrier Ethernet Features

For information about configuring an Ethernet interface as a layer 2 Ethernet virtual circuit (EVC) or Ethernet flow point (EFP), see the Ethernet Virtual Connections Configuration.

Saving the Configuration

To save your running configuration to NVRAM, use the following command in privileged EXEC configuration mode:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>copy running-config startup-config</td>
<td>Writes the new configuration to NVRAM.</td>
</tr>
</tbody>
</table>

```
Router# copy running-config startup-config
```

For information about managing your system image and configuration files, refer to the Cisco IOS Configuration Fundamentals Configuration Guide and Cisco IOS Configuration Fundamentals Command Reference publications that correspond to your Cisco IOS software release.

Shutting Down and Restarting an Interface

You can shut down and restart any of the interface ports on an interface module independently of each other. Shutting down an interface stops traffic and enters the interface into an “administratively down” state.

If you are preparing for an OIR of an interface module, it is not necessary to independently shut down each of the interfaces prior to deactivation of the module.
Purpose

Restarts, stops, or starts an interface.

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>shutdown</td>
<td>Restarts, stops, or starts an interface.</td>
</tr>
<tr>
<td></td>
<td>router#configure terminal Enter configuration commands, one per line. End with CNTL/Z. router(config) router(config)#interface GigabitEthernet 0/1/0 router(config-if)#shutdown</td>
</tr>
<tr>
<td>no shutdown</td>
<td>router#configure terminal Enter configuration commands, one per line. End with CNTL/Z. router(config) router(config)#interface GigabitEthernet 0/1/0 router(config-if)#no shutdown</td>
</tr>
</tbody>
</table>

Shutting Down and Restarting an Interface Module

You can use the following commands in EXEC mode to automatically stop traffic on the affected interfaces and deactivate them along with the interface module in preparation for OIR:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>hw-module subslot slot/subslot [reload [force]</td>
<td>start</td>
</tr>
</tbody>
</table>

Verifying the Interface Configuration

Besides using the `show running-configuration` command to display the configuration settings, you can use the `show interfaces gigabitethernet` command to get detailed information on a per-port basis for your Gigabit Ethernet interface module.

Verifying Per-Port Interface Status

To find detailed interface information on a per-port basis for the Gigabit Ethernet interface module, use the `show interfaces gigabitethernet` command.

The following example provides sample output for interface port 0 on the interface module located in slot 1:

```
Router# show interfaces GigabitEthernet0/1/0
GigabitEthernet0/1/0 is up, line protocol is up
    Hardware is A900-IMA8T , address is d0c2.8216.0590 (bia d0c2.8216.0590)
    MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
         reliability 255/255, txload 1/255, rxload 1/255
    Encapsulation ARPA, loopback not set
    Keepalive set (10 sec)
    Full Duplex, 1000Mbps, link type is auto, media type is RJ45
```
Verifying Interface Module Status

You can use various `show` commands to view information specific to SFP, XFP, CWDM, and DWDM optical transceiver modules.

Note

The `show interface transceiver` command is not supported on the router.

To check or verify the status of an SFP Module or XFP Module, use the following `show` commands:

Use `show hw-module slot/subslot transceiver port status` or `show interfaces interface transceiver detail` to view the threshold values for temperature, voltage and so on.

For example, `show hw-module subslot 0/5 transceiver 1 status` or `show interfaces tenGigabitEthernet 0/5/1 transceiver detail`.

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| `show hw-module slot/subslot transceiver port idprom` | Displays information for the transceiver identification programmable read only memory (idprom).  
**Note** Transceiver types must match for a connection between two interfaces to become active. |
| `show hw-module slot/subslot transceiver port idprom status` | Displays information for the transceiver initialization status.  
**Note** The transmit and receive optical power displayed by this command is useful for troubleshooting Digital Optical Monitoring (DOM). For interfaces to become active, optical power must be within required thresholds. |
| `show hw-module slot/subslot transceiver port idprom dump` | Displays a dump of all EEPROM content stored in the transceiver. |

The following `show hw-module subslot` command sample output is for 1000BASE BX10-U:
Router#show hw-module subslot 0/2 transceiver 0 idprom brief

IDPROM for transceiver GigabitEthernet0/2/0:
Description = SFP or SFP+ optics (type 3)
Transceiver Type: = 1000BASE BX10-U (259)
Product Identifier (PID) = GLC-BX-U
Vendor Revision = 1.0
Serial Number (SN) = NPH20441771
Vendor Name = CISCO-NEO
Vendor OUI (IEEE company ID) = 00.15.06 (5382)
CLEI code = IPUIAG5RAC
Cisco part number = 10-2094-03
Device State = Enabled.
Date code (yy/mm/dd) = 16/11/12
Connector type = LC.
Encoding = 8B10B (1)
Nominal bitrate = GE (1300 Mbits/s)
Minimum bit rate as % of nominal bit rate = not specified
Maximum bit rate as % of nominal bit rate = not specified
Router#

The following show hw-module subslot command sample output is for an SFP+ 10GBASE-SR:

Router#show hw-module subslot 0/2 transceiver 8 idprom brief

IDPROM for transceiver TenGigabitEthernet0/2/8:
Description = SFP or SFP+ optics (type 3)
Transceiver Type: = SFP+ 10GBASE-SR (273)
Product Identifier (PID) = SFP-10G-SR
Vendor Revision = 2
Serial Number (SN) = JUR2052G19W
Vendor Name = CISCO-LUMENTUM
Vendor OUI (IEEE company ID) = 00.01.9C (412)
CLEI code = COU1A8NCA
Cisco part number = 10-2415-03
Device State = Enabled.
Date code (yy/mm/dd) = 16/12/21
Connector type = LC.
Encoding = 64B/66B (6)
Nominal bitrate = (10300 Mbits/s)
Minimum bit rate as % of nominal bit rate = not specified
Maximum bit rate as % of nominal bit rate = not specified
Router#

Note
VID for optics displayed in show inventory command and vendor revision shown in idprom detail command output are stored in different places in Idprom.

Configuring LAN/WAN-PHY Controllers

The LAN/WAN-PHY controllers are configured in the physical layer control element of the Cisco IOS XE software.
Restrictions for LAN/WAN-PHY Mode

- Effective with Cisco IOS XE Release 3.18.1SP, A900-IMA8Z Interface Modules (IM) support LAN/WAN-PHY mode on the Cisco ASR 900 RSP3 Module.
- The following A900-IMA8Z IM alarms are not supported on the Cisco ASR 900 RSP3 Module:
  - NEWPTR
  - PSE
  - NSE
  - FELCDP
  - FEAISP

Configuring LAN-PHY Mode

This section describes how to configure LAN-PHY mode on the Gigabit Ethernet interface modules.

Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> show controllers wanphy slot/subslot/port</td>
<td>Displays the configuration mode of the LAN/WAN-PHY controller. Default configuration mode is LAN.</td>
</tr>
</tbody>
</table>

Example:

```
Router# show controllers wanphy 0/1/0
TenGigabitEthernet0/1/0
Mode of Operation: WAN Mode
SLOT
LOF = 0 LOS = 0
BIP(B1) = 0
LINE
AIS = 0 RDI = 0
FEBE = 0 BIP(B2) = 0
PATH
AIS = 0 RDI = 0
FEBE = 0 BIP(B3) = 0
LOP = 0 NEWPTR = 0
PSE = 0 NSE = 0
WIS ALARMS
SER = 0 FELCDP = 0
FEAISP = 0
WLOS = 0 PLCD = 0
LFEBIP = 0 PBEC = 0
Active Alarms[All defects]: SWLOF LAIS PAIS SER
Active Alarms[Highest Alarms]: SWLOF
Alarm reporting enabled for: SF SWLOF
B1-TCA B2-TCA PLOP WLOS
Rx(K1/K2): 00/00 Tx(K1/K2): 00/00
SISO - 00, C2 = 0x1A
PATH TRACE BUFFER: UNSTABLE
Remote J1 Byte :
BER thresholds: SD = 10e-6 SF = 10e-3
```

If the configuration mode is WAN, complete the rest of the procedure to change the configuration mode to LAN.

- `slot/subslot/port`—The location of the interface.
### Purpose

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCA thresholds: B1 = 10e-6 B2 = 10e-6 B3 = 10e-6</td>
<td></td>
</tr>
</tbody>
</table>

### Step 2

**configure terminal**

**Example:**

Router# configure terminal

Enters global configuration mode.

### Step 3

Do one of the following:

- `hw-module subslot slot/subslot enable LAN`
- `hw-module subslot slot/subslot interface port enable LAN`

**Example:**

Router(config)# hw-module subslot 0/1 enable LAN

Configures LAN-PHY mode for the Ethernet interface module.

- `slot/subslot/port`—The location of the interface.

**hw-module subslot slot/subslot enable LAN** command is only applicable for A900-IMA1X on the ASR 903 RSP1 and RSP2 Modules.

Use the `hw-module subslot slot/subslot interface port enable LAN` command to configure the LAN-PHY mode for the Ethernet interface module on the ASR 903 RSP3 Module.

### Step 4

**exit**

**Example:**

Router(config)# exit

Exits global configuration mode and enters privileged EXEC mode.

### Step 5

**show controllers wanphy slot/subslot/port**

**Example:**

Router# show controllers wanphy 0/1/0

Displays configuration mode for the LAN/WAN-PHY controller. The example shows the mode of operation as LAN mode for the Cisco 8-Port 10 Gigabit Ethernet LAN/WAN-PHY Controller.

---

### Configuring WAN-PHY Mode

This section describes how to configure WAN-PHY mode on the Gigabit Ethernet interface modules.

#### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>show controllers wanphy slot/subslot/port</strong></td>
<td>Displays the configuration mode of the WAN-PHY controller. Default configuration mode is LAN.</td>
</tr>
</tbody>
</table>

- `slot/subslot/port`—The location of the interface.

**Example:**

Router# show controllers wanphy 0/1/0

TenGigabitEthernet0/1/0

Mode of Operation: LAN Mode
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Configures WAN-PHY mode for the Ethernet interface module.</td>
</tr>
<tr>
<td>Do one of the following:</td>
<td></td>
</tr>
<tr>
<td>• hw-module subslot slot/subslot enable WAN</td>
<td></td>
</tr>
<tr>
<td>• hw-module subslot slot/subslot interface port enable WAN</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router(config)# hw-module subslot 0/1 enable WAN</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Exits global configuration mode and enters privileged EXEC mode.</td>
</tr>
<tr>
<td>exit</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router(config)# exit</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Displays configuration mode for the LAN/WAN-PHY controller.</td>
</tr>
<tr>
<td>show controllers wanphy slot/subslot/port</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router# show controllers wanphy 0/1/5</td>
<td>TenGigabitEthernet0/1/5</td>
</tr>
<tr>
<td>Mode of Operation: WAN Mode</td>
<td></td>
</tr>
<tr>
<td>SECTION</td>
<td></td>
</tr>
<tr>
<td>LOF = 0</td>
<td>LOS = 0</td>
</tr>
<tr>
<td>BIP(B1) = 0</td>
<td></td>
</tr>
<tr>
<td>LINE</td>
<td></td>
</tr>
<tr>
<td>AIS = 0</td>
<td>RDI = 0</td>
</tr>
<tr>
<td>FEBE = 0</td>
<td>BIP(B2) = 0</td>
</tr>
<tr>
<td>PATH</td>
<td></td>
</tr>
<tr>
<td>AIS = 0</td>
<td>RDI = 0</td>
</tr>
<tr>
<td>FEBE = 0</td>
<td>BIP(B3) = 0</td>
</tr>
<tr>
<td>LOP = 0</td>
<td>NEWPTR = 0</td>
</tr>
<tr>
<td>PSE = 0</td>
<td>NSE = 0</td>
</tr>
<tr>
<td>WIS ALARMS</td>
<td></td>
</tr>
<tr>
<td>SER = 0</td>
<td>FELCDP = 0</td>
</tr>
<tr>
<td>FEAIISP = 0</td>
<td></td>
</tr>
<tr>
<td>WLOS = 0</td>
<td>PLCD = 0</td>
</tr>
<tr>
<td>LFEBIP = 0</td>
<td>PBEC = 0</td>
</tr>
<tr>
<td>Active Alarms[All defects]: SWLOF AIS SER</td>
<td></td>
</tr>
<tr>
<td>Active Alarms[Highest Alarms]: SWLOF</td>
<td></td>
</tr>
</tbody>
</table>
**Purpose**

Command or Action | Purpose
--- | ---
Alarm reporting enabled for: SF SWLOF B1-TCA B2-TCA PLOP WLOS Rx(K1/K2): 00/00 Tx(K1/K2): 00/00 S1S0 = 00, C2 = 0x1A PATH TRACE BUFFER: UNSTABLE Remote J1 Byte : BER thresholds: SD = 10e-6 SF = 10e-3 TCA thresholds: B1 = 10e-6 B2 = 10e-6 B3 = 10e-6

---

### Configuring the Flag for Path Trace

The 1-Port 10GE LAN/WAN-PHY Shared Port Adapter can operate in either the WAN mode or the LAN mode. To check end-to-end connectivity, J1 flag byte values can be configured on the local SPA. The configured J1 byte values are displayed at the remote end in the `show controllers wanphy interface-path-id` command output.

#### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>configure terminal</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router# configure terminal</td>
</tr>
<tr>
<td>Enters the global configuration mode.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>controller wanphy interface-path-id</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config)# controller wanphy 2/1/0</td>
</tr>
<tr>
<td>Enters the controller mode of the WAN-PHY SPA. In this example, it enters slot 1 of SIP 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>wanphy flag j1 transmit string</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-controller)# wanphy flag j1 transmit passing_string_from_localend</td>
</tr>
<tr>
<td>Passes the string of J1 bytes specified to the remote end of WAN-PHY SPA. In this example, the string value passing_string_from_localend is transmitted to the remotely connected WAN-PHY SPA.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>exit</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-controller)# exit</td>
</tr>
<tr>
<td>Exits Controller-configuration (config) mode and enters global configuration mode.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>exit</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config)# exit</td>
</tr>
<tr>
<td>Exits global-configuration (config) mode and enters privilege-exec mode.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>show controller wanphy &lt;interface-path-id&gt;</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Example: Router# show controller wanphy 2/2/0 TenGigabitEthernet0/2/0 Mode of Operation: WAN Mode</td>
</tr>
<tr>
<td>This command must be executed on the remotely connected SPA. The command output displays the string of J1 byte values transmitted from the other end of the WAN-PHY SPA to check the path.</td>
<td></td>
</tr>
</tbody>
</table>
**Configuring WAN-PHY Error Thresholds**

This section describes how to configure WAN-PHY Signal Failure (SF) and Signal Degrade (SD) Bit Error Rate (BER) reporting and thresholds.

An SF alarm is triggered if the line bit error (B2) rate exceeds a user-provisioned threshold range (over the range of 10e-3 to 10e-9).

An SD alarm is declared if the line bit error (B2) rate exceeds a user-provisioned threshold range (over the range of 10e-3 to 10e-9). If the B2 errors cross the SD threshold, a warning about link quality degradation is triggered. The WAN-PHY alarms are useful for some users who are upgrading their Layer 2 core network from a SONET ring to a 10-Gigabit Ethernet ring.

**Before you begin**

The controller must be in the WAN-PHY mode before configuring the SF and SD BER reporting and thresholds.

**Procedure**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td>configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
</tbody>
</table>
Purpose

Command or Action | Purpose
--- | ---
Step 2 | Enters WAN physical controller configuration mode in which you can configure a 10-Gigabit Ethernet WAN-PHY controller.
controller wanphy slot/subslot/port | slot/subslot/port — The location of the interface.
Example: Router(config)# controller wanphy 0/3/0

Step 3 | Configures WAN-PHY controller processing.
wanphy {delay | flag | report-alarm | threshold {b1-tca | b2-tca | sd-ber | sf-ber [bit error rate]}} |
Example: Router(config-controller)# wanphy threshold b1-tca 6

Step 4 | Exits controller configuration mode and enters privileged EXEC mode.
end | Example: Router(config-controller)# end

Configuration Examples

Example: Basic Interface Configuration

The following example shows how to enter the global configuration mode to configure an interface, configure an IP address for the interface, and save the configuration:

! Enter global configuration mode.

!

Router# configure terminal

! Enter configuration commands, one per line. End with CNTL/Z.

!
! Specify the interface address.
!
Router(config)# interface gigabitethernet 0/0/1
!
! Configure an IP address.
!
Router(config-if)# ip address 192.168.50.1 255.255.255.0
!
! Start the interface.
!
Router(config-if)# no shut
!
! Save the configuration to NVRAM.
!
Router(config-if)# exit

Router# copy running-config startup-config

Example: MTU Configuration

---

**Note**
The maximum number of unique MTU values that can be configured on the physical interfaces on the chassis is eight. Use the `show platform hardware pp active interface mtu` command to check the number of values currently configured on the router.

The following example shows how to set the MTU interface to 9216 bytes.

---

**Note**
The interface module automatically adds an additional 38 bytes to the configured MTU interface size.
! Enter global configuration mode.

!

Router# configure terminal

! Enter configuration commands, one per line. End with CNTL/Z.

!

! Specify the interface address

!

Router(config)# interface gigabitethernet 0/0/1

!

! Configure the interface MTU.

!

Router(config-if)# mtu 9216

Example: VLAN Encapsulation

The following example shows how to configure interface module port 2 (the third port) and configure the first interface on the VLAN with the ID number 268 using IEEE 802.1Q encapsulation:

! Enter global configuration mode.

!

Router# configure terminal

! Enter configuration commands, one per line. End with CNTL/Z.

!

! Enter configuration commands, one per line. End with CNTL/Z.

!

Router(config)# service instance 10 ethernet

!

! Configure dot1q encapsulation and specify the VLAN ID.

Router(config-subif)# encapsulation dot1q 268

!

Note

VLANs are supported only on EVC service instances and Trunk EFP interfaces.