



Configuring LAN/WAN-PHY Controllers

This module describes the configuration of LAN/WAN-PHY controllers on the Cisco CRS-1 Router.

Feature History for Configuring LAN/WAN-PHY Controller Interfaces

Release	Modification
Release 3.5.2	This feature was introduced on the Cisco CRS-1 Router. Support was added for the 1-Port 10-Gigabit Ethernet LAN/WAN-PHY Shared Port Adapter (SPA-1X10GE-WL-V2).
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	Support was added for user configuration of WAN-PHY Signal Failure (SF) and Signal Degrade (SD) Bit Error Rate (BER) reporting and thresholds.
Release 4.0.0	Support was added for the following physical layer interface modules (PLIMs): <ul style="list-style-type: none">• 14-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (14X10GBE-WL-XFP) (with the Cisco CRS-3 Modular Services Card or Cisco CRS-3 Forwarding Processor Card)• 20-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (20X10GBE-WL-XFP) (with the Cisco CRS-3 Modular Services Card or Cisco CRS-3 Forwarding Processor Card)

Release 4.0.1	Support was added for the following PLIMs: <ul style="list-style-type: none"> • 4-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (4-10GBE-WL-XFP) • 8-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (8-10GBE-WL-XFP)
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Prerequisites for Configuring LAN/WAN-PHY Controller 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 a LAN/WAN-PHY controller, be sure that the following tasks and conditions are met:

- You have installed one of the following cards that supports the LAN/WAN-PHY controller:
 - 1-Port 10-Gigabit Ethernet LAN/WAN-PHY Shared Port Adapter
 - 4-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (XFP optics)
 - 8-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (XFP optics)
 - 14-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM
 - 20-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM

Restrictions

The LAN/WAN-PHY controller has the following restrictions:

- LAN-PHY mode is configurable using the **lanmode on** command only on the 1-Port 10-Gigabit Ethernet LAN/WAN-PHY SPA. The default mode of the LAN/WAN-PHY controller is WAN mode for the 1-Port 10-Gigabit Ethernet SPA.
- WAN-PHY mode is configurable using the **wanmode on** command only on the 10-Gigabit Ethernet LAN/WAN-PHY PLIMs. The default mode of the LAN/WAN-PHY controller is LAN mode for the following SPAs:
 - 4-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (XFP optics)
 - 8-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (XFP optics)
 - 14-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM
 - 20-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM

Information About the LAN/WAN-PHY Controllers

LAN/WAN-PHY support in Cisco IOS XR software is based on the IEEE 802.3ae standard.

WAN-PHY controllers can only be used as Path Terminating Equipment (PTE). When deploying Ethernet WAN interfaces as endpoints or PTE between routers, the other endpoint must be an Ethernet WAN interface. WAN-PHY will not interoperate and terminate on a PoS (Packet over Sonet) or EoS (Ethernet over Sonet) port. Between devices (LTE - Line Terminating Equipment or STE - Section Terminating Equipment), the endpoints can be an Add-Drop Multiplexer (ADM) or Dense Wavelength Division Multiplexing (DWDM) OC-192c POS interfaces.

The purpose of WAN-PHY is to render 10 Gigabit Ethernet compatible with the SONET STS-192c format and data rate, as defined by ANSI, as well as the SDH VC-4-64c container specified by ITU. To achieve this compatibility, a WAN Interface Sublayer (WIS) is inserted between the 10 Gigabit Ethernet Physical Coding Sublayer (PCS) and the serial Physical Medium Attachment sublayer/Physical Medium Dependent sublayer (PMA/PMD). When the controller is in WAN-PHY mode the WIS sublayer transports 10 Gigabit Ethernet frames in an OC-192c SONET payload which can interoperate with SONET section or line level repeaters. This effectively bridges the asynchronous world of Ethernet data with synchronous SONET/SDH transport allowing 10 Gigabit Ethernet to be transparently carried over current DWDM networks without having to directly map the Ethernet frames into SONET/SDH.

At a high-level, the WIS has the following characteristics and functions:

- The WIS allows WAN-PHY equipment to generate an Ethernet data stream to be mapped to an OC-192c or VC-4-64c concatenated payload at the PHY level without any MAC or higher layer processing.
- In theory, a 10GBASE-W interface is not intended to interoperate directly with SONET/SDH equipment because WAN-PHY is not fully compliant with SONET/SDH optical and electrical specifications. In practice, SONET/SDH and 10GBASE-W interfaces can interoperate.
- From a MAC perspective, WAN-PHY does not appear any different from LAN-PHY (no WIS) with the exception of the sustained data rate. In the case of LAN-PHY the data rate is 10.3125 Gbps, while at WAN-PHY it is 9.95328 Gbps (as required by SONET/SDH).



Note For information on the data rates for the SPA-1X10GE-WL-V2, refer to Table 4, *Feature and Application Comparison Between 10 Gigabit Ethernet Interfaces*, in the Cisco 1-Port 10 Gigabit Ethernet LAN/WAN-PHY Shared Port Adapter data sheet:

http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/shared-port-adapters-spa-interface-processors/product_data_sheet0900aecd80715dc5.html

- The WIS implements a subset of the SONET functions including creating the Section, Line, Path Overhead headers, calculating the Bit Interleaved Parity (BIP) bytes for error monitoring and managing a variety of alarms and defect indications.

Beside the frame format and data rate 10GBASE-W and Packet over SONET (POS) have very little in common:

- POS and 10GBASE-W cannot in fact interoperate on the same link since the protocol architecture is completely different. POS is based on a serial protocol like PPP whose frames are logically and physical different from Ethernet MAC frames.
- From a Service Provider point of view, POS is a L3 point-to-point service while WAN-PHY is a L2 Ethernet hand-off. WAN-PHY should be compared more properly to an Ethernet over SONET (EoS) encapsulation technology, such as ITU-T X.86 or GFP (ITU-T G.7041) where the Ethernet frame is encapsulated respectively in an HDLC-like or GFP frame.
- POS is optically and electrically compatible with SONET/SDH protocols whereas WAN-PHY is not.
- Cisco POS supports linear Automatic Protection Switching (APS) to restore link failures in 50 msec, while WAN-PHY is not designed to support APS.
- The synchronous nature of POS requires clocking to be configured either “internal” or “line” (Internal clocking is used when the POS interface is connected to another POS in back-to-back or through DWDM, while the line clocking is required when the POS is connected to a SONET/SDH add/drop multiplexer). WAN-PHY has no requirement to support line clocking.

How to Configure LAN/WAN-PHY Controllers

The LAN/WAN-PHY controllers are configured in the physical layer control element of the Cisco IOS XR software configuration space. By default the 1-Port 10GE LAN/WAN-PHY Shared Port Adapter boots up in WAN-PHY mode. LAN-PHY mode configuration is done using the **controller wanphy** command.

Configuration of LAN/WAN-PHY controllers is described in the following tasks.



Note All interface configuration tasks for the POS or GE interfaces still must be performed in interface configuration mode. Refer to *Configuring POS Interfaces on Cisco IOS XR Software* and *Configuring Ethernet Interfaces on Cisco IOS XR Software* modules for more information.

Configuring LAN-PHY Mode

This task describes how to configure LAN-PHY mode on the 1-Port 10-Gigabit Ethernet LAN/WAN-PHY SPA, which by default operates in WAN-PHY mode.



Note After configuring LAN-PHY mode and reloading the SPA, all links are in the UP state.

Before you begin

You have the 1-Port 10-Gigabit Ethernet LAN/WAN-PHY SPA installed.

SUMMARY STEPS

1. **show controllers wanphy** *interface-path-id* [alarms | all | registers]
2. **configure**

3. **controller wanphy** *interface-path-id*
4. **lanmode on**
5. **end** or **commit**
6. **hw-module subslot** *interface-path-id* **reload**
7. **show controllers wanphy** *interface-path-id* [**alarms** | **all** | **registers**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>show controllers wanphy <i>interface-path-id</i> [alarms all registers]</p> <p>Example:</p> <pre>RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 all Tue Jan 5 23:01:18.641 PST Interface: wanphy0_6_1_0 Configuration Mode: WAN Mode</pre>	Displays the configuration mode of the LAN/WAN-PHY controller. By default, prior to configuration of LAN-PHY mode the controller will be in WAN-PHY mode.
Step 2	<p>configure</p> <p>Example:</p> <pre>RP/0/RP0/CPU0:router# configure</pre>	Enters global configuration mode.
Step 3	<p>controller wanphy <i>interface-path-id</i></p> <p>Example:</p> <pre>RP/0/RP0/CPU0:router(config)# controller wanphy 0/6/1/0</pre>	Specifies the LAN/WAN-PHY controller name in the notation <i>rack/slot/module/port</i> and enters wanphy configuration mode.
Step 4	<p>lanmode on</p> <p>Example:</p> <pre>RP/0/RP0/CPU0:router(config-wanphy)# lanmode on Tue Jan 5 23:08:09.024 PST To complete the mode change the SPA must be power-cycled.</pre>	Configures LAN-PHY mode.
Step 5	<p>end or commit</p> <p>Example:</p> <pre>RP/0/RP0/CPU0:router(config-wanphy)# end or RP/0/RP0/CPU0:router(config-wanphy)# 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> - Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.

	Command or Action	Purpose
		<ul style="list-style-type: none"> - 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	hw-module subslot <i>interface-path-id</i> reload Example: RP/0/RP0/CPU0:router# hw-module subslot 0/6/1 reload	Reloads the SPA in the notation <i>rack/slot/module</i> . To complete the mode change from WAN-PHY to LAN-PHY the SPA must be power-cycled.
Step 7	show controllers wanphy <i>interface-path-id</i> [alarms all registers] Example: RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 all Tue Jan 5 23:28:37.738 PST Interface: wanphy0_6_1_0 Configuration Mode: LAN Mode	Displays the configuration mode of the LAN/WAN-PHY controller.

Troubleshooting Tips

The SPA must be power-cycled to complete the controller mode change.

Examples

The following example shows how to configure LAN-PHY mode from a controller in default WAN-PHY mode for the 1-Port 10-Gigabit Ethernet LAN/WAN-PHY SPA:

```
RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 all
Tue Jan 12 20:53:20.945 PST
Interface: wanphy0_6_1_0
Configuration Mode: WAN Mode
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# controller wanphy 0/6/1/0
RP/0/RP0/CPU0:router(config-wanphy)# lanmode on
Tue Jan 12 20:55:49.610 PST
To complete the mode change the SPA must be power-cycled.
RP/0/RP0/CPU0:router(config-wanphy)# end
Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: yes
RP/0/RP0/CPU0:router# hw-module subslot 0/6/1 reload
RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 all
Tue Jan 12 20:57:28.779 PST
Interface: wanphy0_6_1_0
```

Configuration Mode: LAN Mode

The following example shows how to configure WAN-PHY mode from a controller configured in LAN-PHY mode for the 1-Port 10-Gigabit Ethernet LAN/WAN-PHY SPA:

```
RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 all
Tue Jan 12 20:03:46.483 PST
Interface: wanphy0_6_1_0
Configuration Mode: LAN Mode
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# controller wanphy 0/6/1/0
RP/0/RP0/CPU0:router(config-wanphy)# no lanmode on
Tue Jan 12 20:35:06.523 PST
To complete the mode change the SPA must be power-cycled.
RP/0/RP0/CPU0:router(config-wanphy)# end
Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: yes
RP/0/RP0/CPU0:router# hw-module subslot 0/6/1 reload
RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 all
Tue Jan 12 20:39:32.570 PST
Interface: wanphy0_6_1_0
Configuration Mode: WAN Mode
```

What to Do Next

All interface configuration tasks for the POS or GE interfaces still must be performed in interface configuration mode. Refer to *Configuring POS Interfaces on Cisco IOS XR Software* and *Configuring Ethernet Interfaces on Cisco IOS XR Software* modules for more information.

Configuring WAN-PHY Mode

This task describes how to configure WAN-PHY mode on the 10-Gigabit Ethernet LAN/WAN-PHY PLIMs.

Before you begin

You have one of the following 10-Gigabit Ethernet LAN/WAN-PHY PLIMs installed:

- 4-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (XFP optics)
- 8-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (XFP optics)
- 14-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM
- 20-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM

SUMMARY STEPS

1. **configure**
2. **controller wanphy** *interface-path-id*
3. **wanmode on**
4. **end** or **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/RP0/CPU0:router# configure	Enters global configuration mode.
Step 2	controller wanphy <i>interface-path-id</i> Example: RP/0/RP0/CPU0:router(config)# controller wanphy 0/6/1/0	Specifies the LAN/WAN-PHY controller name in the notation <i>rack/slot/module/port</i> and enters wanphy configuration mode.
Step 3	wanmode on Example: RP/0/RP0/CPU0:router(config-wanphy)# wanmode on	Configures WAN-PHY mode.
Step 4	end or commit Example: RP/0/RP0/CPU0:router(config-wanphy)# end or RP/0/RP0/CPU0:router(config-wanphy)# 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.

What to do next

All interface configuration tasks for the POS or GE interfaces still must be performed in interface configuration mode. Refer to *Configuring POS Interfaces on Cisco IOS XR Software* and *Configuring Ethernet Interfaces on Cisco IOS XR Software* modules for more information.

Configuring WAN-PHY Signal Failure and Signal Degrade Bit Error Rates

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

A Signal Failure (SF) alarm is declared if the line bit error (B2) rate exceeds a user provisioned threshold (over the range of 10e-3 to 10e-9). If the B2 errors cross the SF threshold then the link is considered unreliable and the interface changes the state to down.

A Signal Degrade (SD) alarm is declared if the line bit error (B2) rate exceeds a user provisioned threshold (over the range of 10e-3 to 10e-9). If the B2 errors cross the SD threshold then a warning of link quality degradation will occur.

The SF or SD alarm is cleared when the B2 error count remains below the configured threshold for a period of time called the Hold on Time. This table lists the configured SF and SD threshold values and the corresponding Hold on Times.

Table 1: SF and SD Configured Threshold Value Hold on Times

Configured Threshold Value	Hold on Time (max) in seconds
10e-3	13
10e-4	13
10e-5	13
10e-6	13
10e-7	20
10e-8	110
10e-9	1010

These WAN-PHY alarms are required 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 WAN-PHY mode prior to configuring Signal Failure (SF) and Signal Degrade (SD) Bit Error Rate (BER) reporting and thresholds.

Restrictions

SF and SD BER is not supported on the following cards:

- 4-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (XFP optics)
- 8-Port 10-Gigabit Ethernet LAN/WAN-PHY PLIM (XFP optics)

SUMMARY STEPS

1. **show controllers wanphy interface-path-id [alarms | all | registers]**
2. **configure**
3. **controller wanphy interface-path-id**

4. **report sd-ber**
5. **report sf-ber disable**
6. **threshold sd-ber range**
7. **threshold sf-ber range**
8. **end** or **commit**
9. **show controllers wanphy interface-path-id [alarms | all | registers]**

DETAILED STEPS

	Command or Action	Purpose
Step 1	show controllers wanphy interface-path-id [alarms all registers] Example: <pre>RP/0/RP0/CPU0:router#show controllers wanphy 0/6/1/0 all Tue Jan 19 22:32:50.591 PST Interface: wanphy0_6_1_0 Configuration Mode: WAN Mode</pre>	Displays the configuration mode of the LAN/WAN-PHY controller.
Step 2	configure Example: <pre>RP/0/RP0/CPU0:router# configure</pre>	Enters global configuration mode.
Step 3	controller wanphy interface-path-id Example: <pre>RP/0/RP0/CPU0:router(config)# controller wanphy 0/6/1/0</pre>	Specifies the LAN/WAN-PHY controller name in the notation <i>rack/slot/module/port</i> and enters wanphy configuration mode.
Step 4	report sd-ber Example: <pre>RP/0/RP0/CPU0:router(config-wanphy)#report sd-ber</pre>	Enables signal degrade (sd) bit error rate (ber) reporting. Note <ul style="list-style-type: none"> • By default sd-ber reporting is disabled.
Step 5	report sf-ber disable Example: <pre>RP/0/RP0/CPU0:router(config-wanphy)#report sf-ber disable</pre>	Disables signal fault (sf) bit error rate (ber) reporting. Note <ul style="list-style-type: none"> • By default sf-ber reporting is enabled.
Step 6	threshold sd-ber range Example: <pre>RP/0/RP0/CPU0:router(config-wanphy)#threshold sd-ber 7</pre>	Specifies the signal degrade (sd) bit error rate (ber) threshold. <ul style="list-style-type: none"> • Range is 3 to 9. • Range value is expressed exponentially as 10e-n. Note <ul style="list-style-type: none"> • The default sd-ber value is 6 (10e-6).

	Command or Action	Purpose
Step 7	<p>threshold sf-ber <i>range</i></p> <p>Example:</p> <pre>RP/0/RP0/CPU0:router(config-wanphy)#threshold sf-ber 4</pre>	<p>Specifies the signal fault (sf) bit error rate (ber) threshold.</p> <ul style="list-style-type: none"> • Range is 3 to 9. • Range value is expressed exponentially as 10e-n. <p>Note</p> <ul style="list-style-type: none"> • The default sf-ber value is 3 (10e-3).
Step 8	<p>end or commit</p> <p>Example:</p> <pre>RP/0/RP0/CPU0:router(config-dwdm)# end</pre> <p>or</p> <pre>RP/0/RP0/CPU0:router(config-dwdm)# 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. <ul style="list-style-type: none"> • Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.
Step 9	<p>show controllers wanphy <i>interface-path-id</i> [alarms all registers]</p> <p>Example:</p> <pre>RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 alarms Wed Jan 20 19:25:51.462 PST Interface: wanphy0_6_1_0 Configuration Mode: WAN Mode BER thresholds: SF = 10e-4 SD = 10e-7 Alarm reporting enabled for: sd ber,</pre>	<p>Displays the configuration of the Signal Failure (SF) and Signal Degrade (SD) Bit Error Rate (BER) reporting and thresholds.</p>

Examples

The following example shows how to configure WAN-PHY Signal Failure (SF) and Signal Degrade (SD) Bit Error Rate (BER) reporting and thresholds and how to display the configuration and current statistics:

```
RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 all
Wed Jan 20 19:15:44.751 PST
Interface: wanphy0_6_1_0
```

```

Configuration Mode: WAN Mode
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# controller wanphy 0/6/1/0
RP/0/RP0/CPU0:router(config-wanphy)# report sd-ber
RP/0/RP0/CPU0:router(config-wanphy)# threshold sd-ber 7
RP/0/RP0/CPU0:router(config-wanphy)# threshold sf-ber 4
RP/0/RP0/CPU0:router(config-wanphy)# end
Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: yes
RP/0/RP0/CPU0:router# show controllers wanphy 0/6/1/0 alarms
Wed Jan 20 19:25:51.462 PST
Interface: wanphy0_6_1_0
Configuration Mode: WAN Mode
SECTION
  LOF = 1, LOS = 1, BIP(B1) = 0
LINE
  AIS = 1, RDI = 0, FEBE = 0, BIP(B2) = 0
PATH
  AIS = 1, RDI = 0, FEBE = 0, BIP(B3) = 0
  LOP = 0, NEWPTR = 0, PSE = 0, NSE = 0
WIS ALARMS
  SER = 1, FELCDP = 0, FEAISP = 0
  WLOS = 1, PLCD = 0
  LFEBIP = 0, PBEC = 0
Active Alarms[All defects]: lof, path ais, line ais, sef,
Active Alarms[Highest Alarms]: lof
  Rx(K1/K2): N/A, Tx(K1/K2): N/A
  S1S0 = N/A, C2 = N/A
PATH TRACE BUFFER
Remote IP addr:
BER thresholds: SF = 10e-4 SD = 10e-7
TCA thresholds: N/A
Alarm reporting enabled for: sf ber, sd ber,

```