



Configuring PTP

Table 1: Feature History Table

Feature name	Release Information	Feature Description
Precision Time Protocol (PTP) Support on 88-LC0-36FH-M Line card and 8202-32FH-M Router	Release 7.5.2	<p>With this release, support for Precision Time Protocol (PTP) telecom profiles 8273.2 and 8275.1 is extended to the following:</p> <ul style="list-style-type: none"> • 88-LC0-36FH-M line card • 8202-32FH-M router <p>Support of PTP profile 8273.2 allows distribution of time and phase synchronization for packet-based network. Support of PTP profile 8275.1 enables network element interoperability for the delivery of accurate phase and time synchronization.</p>
Support for Precision Time Protocol (PTP)	Release 7.3.1	<p>Precision Time Protocol (PTP) is based on the IEEE 1588-2008 clock synchronization standard and enables clocks in a distributed system to be synched with highly precise clocks. The precision in time synchronization is achieved through packets that are transmitted and received in a session between the primary clock and secondary clock. PTP also ensures that the best clock is selected as a timing source (the primary clock) and all other clocks are synchronized with the primary clock.</p>

Precision Time Protocol (PTP) is a protocol that defines a method to distribute time around a network. PTP support is based on the IEEE 1588-2008 standard.

This module describes the concepts around this protocol and details the various configurations involved.

- [PTP Overview, on page 2](#)
- [Performance Monitoring for PTP Networks, on page 9](#)
- [ITU-T Telecom Profiles for PTP, on page 14](#)
- [ITU-T Telecom Profile Examples, on page 24](#)

PTP Overview

The Precision Time Protocol (PTP), as defined in the IEEE 1588 standard, synchronizes with nanosecond accuracy the real-time clocks of the devices in a network. The clocks are organized into a master-slave hierarchy. PTP identifies the port that is connected to a device with the most precise clock. This clock is referred to as the master clock. All the other devices on the network synchronize their clocks with the master and are referred to as members. Constantly exchanged timing messages ensure continued synchronization. PTP ensures that the best available clock is selected as the source of time (the grandmaster clock) for the network and that other clocks in the network are synchronized to the grandmaster.

Table 2: PTP Clocks

Network Element	Description
Grandmaster (GM)	A network device physically attached to the primary time source. All clocks are synchronized to the grandmaster clock.
Ordinary Clock (OC)	An ordinary clock is a 1588 clock with a single PTP port that can operate in one of the following modes: <ul style="list-style-type: none"> • Master mode—Distributes timing information over the network to one or more slave clocks, thus allowing the slave to synchronize its clock to the master. • Slave mode—Synchronizes its clock to a master clock. You can enable the slave mode on up to two interfaces simultaneously in order to connect to two different master clocks.
Boundary Clock (BC)	The device participates in selecting the best master clock and can act as the master clock if no better clocks are detected. Boundary clock starts its own PTP session with a number of downstream slaves. The boundary clock mitigates the number of network hops and packet delay variations in the packet network between the Grand Master and Slave.

Network Element	Description
Transparent Clock (TC)	A transparent clock is a device or a switch that calculates the time it requires to forward traffic and updates the PTP time correction field to account for the delay, making the device transparent in terms of time calculations.

PTP consists of two parts:

- The port State machine and Best Master Clock Algorithm: This provides a method to determine state of the ports in the network that will remain passive (neither master nor slave), run as a master (providing time to other clocks in the network), or run as slaves (receiving time from other clocks in the network).
- Delay-Request/Response mechanism and a Peer-delay mechanism: This provides a mechanisms for slave ports to calculate the difference between the time of their own clocks and the time of their master clock.



Note Transparent Clock (TC) is not supported.

Frequency and Time Selection

The selection of the source to synchronize the device clock frequency is made by frequency synchronization, and is outside of the scope of PTP. The Announce, Sync, and Delay-request frequencies must be the same on the master and slave.

Delay Request-Response Mechanism

The Delay Request-response mechanism (defined in section 11.3 of IEEE Std 1588-2008) lets a slave port estimate the difference between its own clock-time and the clock-time of its master. The following options are supported:

- One-step mechanism - The timestamp for a Sync message is sent in the Sync message itself.
- Two-step mechanism - The timestamp for a Sync message is sent later in a Follow-up message.

When running a port in Slave state, a router can send Delay-request messages and handle incoming Sync, Follow-up, and Delay-response messages. The timeout periods for both Sync and Delay-response messages are individually configurable.

Hybrid Mode

Your router allows the ability to select separate sources for frequency and time-of-day (ToD). Frequency selection can be between any source of frequency available to the router, such as: BITS, GPS, SyncE or IEEE 1588 PTP. The ToD selection is between the source selected for frequency and PTP, if available (ToD selection is from GPS, or PTP). This is known as hybrid mode, where a physical frequency source (BITS or SyncE) is used to provide frequency synchronization, while PTP is used to provide ToD synchronization.

Frequency selection uses the algorithm described in ITU-T recommendation G.781. The ToD selection is controlled using the time-of-day priority configuration. This configuration is found under the clock interface frequency synchronization configuration mode and under the global PTP configuration mode. It controls the

order for which sources are selected for ToD. Values in the range of 1 to 254 are allowed, with lower numbers indicating higher priority.

The steps involved in section *Configuring PTP Hybrid Mode* of the topic [G.8275.1, on page 18](#).

Time of Day (ToD) Support

The router receives GPS ToD messages in serial ASCII stream through the RS422 interface in one of the following configurable formats:

- NTP Type 4
- Cisco

Port States for PTP

State machine indicates the behavior of each port. The possible states are:

State	Description
INIT	Port is not ready to participate in PTP.
LISTENING	First state when a port becomes ready to participate in PTP: In this state, the port listens to PTP masters for a (configurable) period of time.
PRE-MASTER	Port is ready to enter the MASTER state.
MASTER	Port provides timestamps for any Slave or boundary clocks that are listening.
UNCALIBRATED	Port receives timestamps from a Master clock but, the router's clock is not yet synchronized to the Master.
SLAVE	Port receives timestamps from a Master clock and the router's clock is synchronized to the Master.
PASSIVE	Port is aware of a better clock than the one it would advertise if it was in MASTER state and is not a Slave clock to that Master clock.

Restrictions for PTP

The following PTP restrictions apply to the Cisco 8000 Series Router:

- Sync2 interface is supported only if 10 MHz, 1 Pulse per Second (PPS) and time-of-day (ToD) ports are configured.
- PTP is not supported with global MACSec.
- PTP is not supported with MACSec on the same interface.
However, PTP is supported if MACSec is not configured on interface.
- PTP is not supported with global MACSec-FIPS-Post.

MACSec-FIPS-Post is not available per interface.

- Transparent Clock is not supported. One-step clock is supported. It can receive follow-up PTP packets, that is, it can support a two-step peer primary but it cannot send follow-up PTP packets.
- When a subinterface is configured with encapsulation default or untag configuration, you must configure PTP on that subinterface, instead of the main interface.
- PTP is configurable on Gigabit Ethernet interfaces (1G, 10G, 40G, and 100G), Bundle Ethernet interfaces, and sub-interfaces. PTP is not configurable on LAG Ethernet sub-interfaces.
- PTP is supported over individual bundle member links and not supported on Bundle-Ether interfaces.

PTP Support Information

This table lists different types of support information related to PTP:

Transport Media	<ul style="list-style-type: none"> • UDP over IPv4 • UDP over IPv6 • Ethernet
Messages	<ul style="list-style-type: none"> • Signaling • Announce • Sync • Follow-up • Delay-request • Delay-response • Management
Transport Modes	<ul style="list-style-type: none"> • Unicast: This is the default mode. All packets are sent as unicast messages. Unicast is applicable only for PTP over IP profiles. • Multicast: All packets are sent as multicast messages. Multicast is the only mode for PTP over ethernet profiles.

Timing Profile and Class Support Matrix

This table provides a detailed information on the timing features that are supported on the Cisco 8000 series routers and line cards.

Table 3: Timing Profile and Class Support Matrix

Hardware Module	Supported Profile	Supported G.8273.2 Class	Cisco IOS XR Release
<ul style="list-style-type: none"> • 8000-RP2 Route Processor • 88-LC0-36FH-M and 8800-LC-36FH line cards 	G8275.1	NA	Release 7.11.1
	G8273.2	Class C	
<ul style="list-style-type: none"> • 88-LC0-36FH-M line card • 8202-32FH-M router 	G.8273.2	Class C	Release 7.5.2
	G.8275.1	NA	
<ul style="list-style-type: none"> • 88-LC0-36FH line card • 88-LC0-34H14FH line card • 8201-32FH router 	G.8273.2	Class C	Release 7.3.3
	G.8275.1	NA	
<ul style="list-style-type: none"> • 8201 router • 8202 router • 8800-LC-48H line card • 8800-LC-36FH line card 	G.8273.2	Class C	Release 7.3.1
	G.8275.1	NA	
	G.8265.1	NA	
	G.8263	NA	

Configuring PTP Delay Asymmetry

Table 4: Feature History Table

Feature Name	Release Information	Description
PTP Delay Asymmetry	Release 7.3.2	<p>Any delays on Precision Time Protocol (PTP) paths can impact PTP accuracy and in turn impact clock settings for all devices in a network. This feature allows you to configure the static asymmetry such that the delay is accounted for and the PTP synchronization remains accurate.</p> <p>The delay-symmetry command is introduced for this feature.</p>

Configure PTP delay asymmetry to offset the static delays on a PTP path that occur due to different route selection for forward and reverse PTP traffic. Delays can also be due to any node having different delay for ingress or egress path. These delays can impact PTP accuracy due to the asymmetry in PTP. With this feature, you can enable a higher degree of accuracy in the PTP server performance leading to better synchronization between real-time clocks of the devices in a network.

Configuration of this delay asymmetry provides an option to configure static delays on a client clock for every server clock. You can configure this delay value in microseconds and nanoseconds. Configured PTP delay asymmetry is also synchronized with the Servo algorithm.

**Note**

- If you configure multiple PTP delay asymmetries for the same PTP profile, the latest PTP delay asymmetry that you configure is applied to the PTP profile.
- For G8275.1 and G8275.2 PTP profiles, PTP delay asymmetry is supported for both, client port and dynamic port that act as a client.
- Fixed delay can be measured by using any test and measurement tool. Fixed delay can be compensated by using the positive or negative values. For example, if the fixed delay is +10 nanoseconds, configure -10 nanoseconds to compensate the fixed delay.

A positive value indicates that the server-to-client propagation time is longer than the client-to-server propagation time, and conversely for negative values.

Supported PTP Profiles

The following PTP profiles support the configuration of PTP delay asymmetry:

- PTP over IP (G8275.2 or default profile)
- PTP over L2 (G8275.1)

Restrictions

- PTP delay asymmetry can be configured only on the PTP port of the grandmaster clock, which can either be a boundary clock or an ordinary clock.
- PTP delay asymmetry is supported for delay compensation of fixed cables and not for variable delay in the network.
- PTP delay asymmetry can be configured within the range of 3 microseconds and -3 microseconds or 3000 nanoseconds and -3000 nanoseconds.

Configuration

To configure PTP delay asymmetry:

1. Configure an interface with PTP.
2. Configure PTP delay asymmetry on the client side.

Configuration Example

```
/* Configure an interface with PTP. */
Router# configure
Router(config)# interface HundredGigE 0/1/0/0
Router(config-if)# ptp

/* Configure PTP delay asymmetry on the client side. */
Router(config-if-ptp)# delay-asymmetry 3 microseconds
Router(config-if-ptp)# commit
```

Running Configuration

```
interface preconfigure HundredGigE 0/1/0/0
  ptp
  delay-asymmetry 3 microseconds
```

Verification

To verify if PTP delay asymmetry is applied, use the **show ptp foreign-masters** command:

```
Router# show ptp foreign-masters
Sun Nov 1 10:19:21.874 UTC
Interface HundredGigE0/1/0/0 (PTP port number 1)
IPv4, Address 209.165.200.225, Unicast
Configured priority: 1
Configured clock class: None
Configured delay asymmetry: 3 microseconds <- configured variable delay asymmetry value
Announce granted: every 2 seconds, 300 seconds
Sync granted: 16 per-second, 300 seconds
Delay-resp granted: 16 per-second, 300 seconds
Qualified for 2 minutes, 45 seconds
Clock ID: 80e01dffffe8ab73f
Received clock properties:
Domain: 0, Priority1: 128, Priority2: 128, Class: 6
Accuracy: 0x22, Offset scaled log variance: 0xcd70
Steps-removed: 1, Time source: GPS, Timescale: PTP
Frequency-traceable, Time-traceable
Current UTC offset: 37 seconds (valid)
Parent properties:
Clock ID: 80e01dffffe8ab73f
Port number: 1
```

To validate the approximate compensated delay value, use the **show ptp platform servo** command:

```
Router# show ptp platform servo
Mon Jun 27 22:32:44.912 UTC
Servo status: Running
Servo stat_index: 2
Device status: PHASE_LOCKED
Servo Mode: Hybrid
Servo log level: 0
Phase Alignment Accuracy: -2 ns
Sync timestamp updated: 18838
Sync timestamp discarded: 0
Delay timestamp updated: 18837
Delay timestamp discarded: 0
Previous Received Timestamp T1: 1657002314.031435081 T2: 1657002314.031436686 T3:
1657002314.026815770 T4: 1657002314.026814372
Last Received Timestamp T1: 1657002314.031435081 T2: 1657002314.031436686 T3:
1657002314.088857790 T4: 1657002314.088856392
Offset from master: 0 secs, 1502 nsecs <<--compensated value shows 1.5 microseconds
because the asymmetry configured under the interface is
3 microseconds.->>
```



```

Mean path delay      : 0 secs, 103 nsecs
setTime():0  stepTime():0  adjustFreq():2
Last setTime: 0.000000000  flag:0  Last stepTime:0  Last adjustFreq:-5093

```

Performance Monitoring for PTP Networks

Table 5: Feature History Table

Feature Name	Release Information	Feature Description
Performance Monitoring	Release 24.3.1	<p>Introduced in this release on: Fixed Systems (8200); Centralized Systems (8600); and Modular Systems (8800[LC ASIC: Q100, Q200, P100])</p> <p>You can now get statistical information with Performance Monitoring in PTP networks, such as clock accuracy, synchronization status, and network delays by defining Performance Monitoring Parameters and Port Specific Parameters.</p> <p>This feature empowers operators with comprehensive performance monitoring and precise time-stamp analysis, offering enhanced granularity for time synchronization in telecommunication networks. By providing detailed insights, it enables operators to make well-informed decisions and take proactive actions to ensure optimal network performance.</p> <p>The feature introduces these changes:</p> <p>CLI:</p> <ul style="list-style-type: none"> • performance-monitoring • show ptp platform performance-counters • show ptp dataset performance <p>YANG Data Models:</p> <ul style="list-style-type: none"> • Cisco-IOS-XR-ptp-cfg.yang • Cisco-IOS-XR-ptp-oper.yang • Cisco-IOS-XR-um-ptp-cfg.yang <p>(see GitHub, YANG Data Models Navigator)</p>

Performance Monitoring in PTP involves tracking and analyzing the performance of PTP networks to ensure accurate time synchronization across devices. This includes monitoring various metrics such as clock accuracy, synchronization status, and network delays. The goal is to identify and address any issues that may affect the precision and reliability of time synchronization in the network.

Performance Monitoring now has the ability to provide performance monitoring and time-stamp analysis information in a PTP network as per Annex J IEEE 1588-2019. This feature also includes additional monitoring

granularity for time synchronization in telecommunication networks as per Annex F from the G8275 standard. For more information on PTP, Best TimeTransmitter Clock Algorithm (BTCA), see [PTP Overview](#).

You can use the following parameters to define the Performance Monitoring in a PTP Network:

- Performance Monitoring Parameters
- Port Specific Parameters

Performance Monitoring Parameters

In addition to using the timestamps received from the grandmaster to sync to the grandmaster's clock, the timestamps can now be used to calculate parameters that are of your interest in performance monitoring:

- **TimeTransmitter - TimeReceiver Delay**: corrected propagation time from TimeTransmitter to TimeReceiver.
- **TimeReceiver - TimeTransmitter Delay**: corrected propagation time from TimeReceiver to TimeTransmitter.
- **Mean Path Delay**: mean propagation time over the PTP Communication Path.
- **Offset from TimeTransmitter**: time difference between a TimeTransmitter PTP instance and a TimeReceiver PTP instance as computed by the TimeReceiver PTP instance.

For each of these parameters, you can measure the average, minimum, maximum, and standard deviation for each measurement. These values are calculated and maintained for the following time intervals over the specified time periods:

- **3-minute**: maintained for the current 1-hour period.
- **15-minute**: maintained for the current 24-hour period.
- **1-hour**: maintained for the current 2-hour period.
- **24-hour**: maintained for the current 48-hour period.

The platform actively calculates the end-to-end latency between the TimeTransmitter and TimeReceiver through the Delay-Request-Response-Mechanism (DRRM), allowing Precision Time Protocol (PTP) to seamlessly operate across networks equipped with Transparent clocks, non-PTP aware switches, or a mix of both. Upon a request, PTP dynamically extracts these calculated values from the servo using a platform specific API, allowing you to make proactive changes to the network to ensure precise time synchronization essential for applications that depend on accurate timing.

Additional Port Specific Parameters

The parameters mentioned above apply to the entire Precision Time Protocol (PTP) instance, and there is an additional set of parameters specific to individual ports. These parameters include the counters for various packet types,

- received (rx) and
- transmitted (tx)

It is important to collect and maintain these counters for performance monitoring purposes, which follows the same time intervals and periods as those used for monitoring clock performance.

Port-specific parameters play a crucial role in ensuring accurate time synchronization. These packet types are essential for maintaining the accuracy and reliability of time synchronization in a PTP network:

- **Sync Packets:** These packets are sent by the master clock to the slave clocks to synchronize their time. They contain the precise time at which the packet was sent.
- **Delay Request Packets:** Sent by the slave clock to the master clock, these packets measure the delay between the master and slave clocks. The master clock responds with a Delay Response packet.
- **Follow-Up Packets:** These packets are sent by the master clock immediately after the Sync packet. They contain the exact time the Sync packet was sent, which helps in correcting any delays introduced by the network.
- **Announce Packets:** These packets are used by the master clock to announce its presence and capabilities to the slave clocks. They help in the selection of the best master clock in the network.
- **Management Packets:** These packets are used for configuration and management purposes within the PTP network. They allow for the adjustment of various parameters and settings.

Record format

Record format refers to the structure or layout of data within a record, which is used to store information about time synchronization events and measurements. This format can include various fields such as timestamps, event types, and other relevant data that PTP uses to maintain accurate time synchronization across a network. It is a single buffer for both annexes.

The format is the same for both clock and port performance monitoring parameters that is presented in the operational data. The data is stored over a 48-hour period, resulting in a list of records as per Annex J 1588-2019, composed of the following:

- 1 record for the current 15-minute set of statistics (stored at position 0 in the buffer).
- 96 records for the 15-minute sets of statistics over the last 24-hour period (stored between positions 1-96 in the buffer).
- 1 record for the current 24-hour set of statistics (stored at position 97 in the buffer).
- 1 record for the previous 24-hour set of statistics (stored at position 98 in the buffer).

The data buffer records data at 3-minute intervals over the most recent 1-hour period, creating a list of records that includes:

- 1 record for the current 3-minute set of statistics (stored at position 100 in the buffer).
- 20 records for the 3-minute set of statistics over the last 1-hour period (stored between positions 101-120).
- 1 record for the current 1-hour set of statistics (stored at position 121 in the buffer).
- 1 record for the previous 1-hour set of statistics (stored at position 122 in the buffer).

Configure PTP Performance Monitoring

The purpose of this task is to configure and verify PTP performance monitoring.

Step 1 Configure the **performance-monitoring** command to enable collection of performance monitoring statistics and for the users to make performance monitoring requests.

Example:

```
Router(config)# ptp
Router(config-ptp)# performance-monitoring
Router(config-ptp)# commit
```

Step 2 Run the **sh ptp platform performance-counters** command to display the details of all 123 records.

The existing command **show ptp platform** is extended to include the performance monitoring data for the local clock. The detail mode of the command displays all 123 records while the brief mode displays only the current windows for 15 minutes, 24 hours, 3minutes, and 1hour.

Example:

```
Router#sh ptp platform performance-counters detail
```

```
PTP Current record index 15 min: 96
PTP Current record index 3 min: 119
```

```
PTP performance monitoring statistics:
```

```
=====
15 min stats
```

```
[0] 12 August 2024 07:08:59 UTC 15 min statistics
=====
```

Stat Samples	Min(sec.nsec)	Max(sec.nsec)	Mean(sec.nsec)	Std deviation
Master-slave-delay 154	-000000000.15937	000000000.333	-000000000.1780	000000000.71191
Slave-master-delay 154	000000000.319	000000000.16593	000000000.2437	000000000.74103
mean-path-delay 154	000000000.322	000000000.334	000000000.327	000000000.4057
offset-from-master 154	-000000000.16263	000000000.6	-000000000.2108	000000000.72546

```
=====
Complete      Valid      PmRef      ServoAtStart  ServoAtEnd      LastServoFlapTime
-----
07:09:09 UTC  FALSE     FALSE     TRUE         PHASE_LOCKED   HOLDOVER        12 Apr 2024
=====
```

....

Step 3 Run the **show ptp dataset performance clock** command to display the performance monitoring data-set details in 15 minutes intervals.

Example:

```
Router#show ptp dataset performance clock
```

```

performanceMonitoringDS for the current 15-minute window:
Clock ID cccfffecccc00, steps removed 1, receiving-port 2:
  Start of time window: Thursday, April 11, 2024 14:18:59
  Measurement is valid
  Period is complete
  Measurement has been taken with reference to system clock
  Master slave delay:
    Average: 50ns
    Min: 50ns
    Max: 70ns
    Std: 1ns
  Slave master delay:
    Average: 51ns
    Min: 51ns
    Max: 71ns
    Std: 2ns
  Mean path delay:
    Average: 52ns
    Min: 52ns
    Max: 72ns
    Std: 3ns
  Offset from master:
    Average: 53ns
    Min: 53ns
    Max: 73ns
    Std: 4ns

```

```

Clock ID aaaabbbcccc00, steps removed 1, receiving-port 2:
  Start of time window: Thursday, April 11, 2024 14:18:59
  Measurement is not valid
  Period is not complete
  Measurement has been taken with reference to system clock
  Master slave delay:
    Average: 50ns
    Min: 50ns
    Max: 70ns
    Std: 1ns
  Slave master delay:
    Average: 51ns
    Min: 51ns
    Max: 71ns
    Std: 2ns
  Mean path delay:
    Average: 52ns
    Min: 52ns
    Max: 72ns
    Std: 3ns
  Offset from master:
    Average: 53ns
    Min: 53ns
    Max: 73ns
    Std: 4ns

```

Step 4 Run the **show ptp dataset performance port** to display the Performance Monitoring Port Data-set in 15 minutes intervals.

Example:

```
Router#show ptp dataset performance port GigabitEthernet 0/0/0/1
```

```

performanceMonitoringPortDS for the current 15-minute window:
Interface GigabitEthernet 0/0/0/1
  Start of time window: Thursday, April 11, 2024 14:18:59
  Measurement is valid
  Period is not complete
  Measurement has been taken with reference to system clock

```

Packets	Sent	Received	Dropped
Announce	3	83	11
Sync	0	32	5
Follow-Up	0	31	0
Delay-Req	22	0	0
Delay-Resp	0	21	7
Pdelay-Req	0	7	0
Pdelay-Resp	0	0	0
Pdelay-Resp-Follow-Up	0	0	0
Signaling	2	1	0
Management	0	0	0
Other	0	3	12
TOTAL	27	178	35

ITU-T Telecom Profiles for PTP

Cisco IOS XR software supports ITU-T Telecom Profiles for PTP as defined in the ITU-T recommendations. A profile is a specific selection of PTP configuration options that are selected to meet the requirements of a particular application.

PTP lets you define separate profiles to adapt itself for use in different scenarios. A telecom profile differs in several ways from the default behavior defined in the IEEE 1588-2008 standard and the key differences are mentioned in the subsequent sections.

The following sections describe the ITU-T Telecom Profiles that are supported for PTP.

G.8265.1

G.8265.1 profile fulfills specific frequency-distribution requirements in telecom networks. Features of G.8265.1 profile are:

- Clock advertisement: G.8265.1 profile specifies changes to values used in Announce messages for advertising PTP clocks. The clock class value is used to advertise the quality level of the clock, while the other values are not used.
- Clock Selection: G.8265.1 profile also defines an alternate Best Master Clock Algorithm (BMCA) to select port states and clocks is defined for the profile. This profile also requires to receive Sync messages (and optionally, Delay-Response messages) to qualify a clock for selection.
- Port State Decision: The ports are statically configured to be Master or Slave instead of using state machines to dynamically set port states.
- Packet Rates: The packet rates higher than rates specified in the IEEE 1588-2008 standard are used. They are:
 - Sync/Follow-Up Packets: Rates from 128 packets-per-second to 16 seconds-per-packet.
 - Delay-Request/Delay-Response Packets: Rates from 128 packets-per-second to 16 seconds-per-packet.
 - Announce Packets: Rates from 8 packets-per-second to 64 packets-per-second.

- Transport Mechanism: G.8265.1 profile only supports IPv4 PTP transport mechanism.
- Mode: G.8265.1 profile supports transport of data packets only in unicast mode.
- Clock Type: G.8265.1 profile only supports Ordinary Clock-type (a clock with only one PTP port).
- Domain Numbers: The domain numbers that can be used in a G.8265.1 profile network ranges from 4 to 23.
- Port Numbers: All PTP port numbers can only be one (1) because all clocks in this profile network are Ordinary Clocks.
- G.8261 class-specification standard is supported.

G.8265.1 profile defines an alternate algorithm to select between different master clocks based on the local priority given to each master clock and their quality levels (QL). This profile also defines Packet Timing Signal Fail (PTSF) conditions to identify the master clocks that do not qualify for selection. They are:

- PTSF-lossSync condition: Raised for master clocks that do not receive a reliable stream of Sync and Delay-Resp messages. Cisco IOS XR software requests Sync and Delay-Resp grants for each configured master clock to track the master clock with this condition.
- PTSF-lossAnnounce condition: Raised for master clocks that do not receive a reliable stream of Announce messages.
- PTSF-unusable condition: Raised for master clocks that receives a reliable stream of Announce, Sync, and Delay-Resp messages, but not usable by slave clocks. Cisco IOS XR software does not use this condition.

Configuring Global G.8265.1 Master Profile

The following configuration describes the steps involved to create a global configuration profile for a PTP interface that can then be assigned to any interface as required. It uses G.8265.1 profile as an example:

```
Router# config terminal
Router(config)# ptp
Router(config-ptp)# clock
Router(config-ptp-clock)# domain 4
Router(config-ptp-clock)# profile g.8265.1 clock-type master
Router(config-ptp-clock)# exit
Router(config-ptp)# profile master
Router(config-ptp-profile)# transport ipv4
Router(config-ptp-profile)# sync frequency 32
Router(config-ptp-profile)# announce frequency 1
Router(config-ptp-profile)# delay-request frequency 32
Router(config-ptp-profile)# exit
```

Verification

To display the configured PTP profile details, use **show run ptp** command.

```
Router# show run ptp

Wed Feb 28 11:16:05.943 UTC
ptp
clock domain 4
profile g.8265.1 clock-type master
!
profile master
```

```

transport ipv4
sync frequency 32
announce frequency 1
delay-request frequency 32
!
```

Configuring Global G.8265.1 Slave Profile

The following configuration describes the steps involved to create a global configuration profile for a PTP interface that can then be assigned to any interface as required. It uses G.8265.1 profile as an example:

```

Router/# config terminal
Router(config)# ptp
Router(config-ptp)# clock
Router(config-ptp-clock)# domain 4
Router(config-ptp-clock)# profile g.8265.1 clock-type slave
Router(config-ptp-clock)# exit
Router(config-ptp)# profile slave
Router(config-ptp-profile)# transport ipv4
Router(config-ptp-profile)# sync frequency 32
Router(config-ptp-profile)# announce frequency 1
Router(config-ptp-profile)# delay-request frequency 32
Router(config-ptp-profile)# exit
```

Verification

To display the configured PTP profile details, use **show run ptp** command.

```

Router# show run ptp

Wed Feb 28 11:16:05.943 UTC
ptp
clock domain 4
profile g.8265.1 clock-type slave
!
profile slave
transport ipv4
sync frequency 32
announce frequency 1
delay-request frequency 32
!
```

Configuring PTP Master Interface

The following configuration describes the steps involved to configure a PTP interface to be a Master.

```

Router# configure terminal
Router(config)# interface HundredGigE 0/0/0/0
Router(config-if)# ipv4 address 18.1.1.1/24
Router(config-if)# ptp
Router(config-if-ptp)# profile master
Router(config-if-ptp)# port state master-only
Router(config-if-ptp)# commit
```


G.8263 Standard

Table 6: Feature History Table

Feature Name	Release Information	Feature Description
Support for ITU-T G.8263 standard for secondary clock with ITU-T G.8265.1 profile	Release 7.3.1	ITU-T G.8263 is a performance compliance standard for secondary clocks configured with ITU-T G.8265.1 profiles. These clocks drive frequency synchronization based on the PTP packets received at the secondary devices, from traceable primary devices.

G.8263 is the performance compliance standard for the clocks with G.8265.1 profile configured. These clocks drive frequency synchronization based on the PTP packets that are received at the secondary devices from traceable primary device. To handle excess PDV in the network, special servo mode is enabled by configuring the **network-type high-pdv** command in the PTP configuration.

Configuration

To configure high PDV mode on the slave clock, use the following steps:

1. Configure telecom profile G.8265.1 and clock-type as slave.
2. Configure network type as high PDV.

Configuration Example

```

/* Configure telecom profile G.8265.1 and clock-type as slave. */
Router# configure
Router(config)# ptp
Router(config-ptp)# clock
Router(config-ptp-clock)# domain 4
Router(config-ptp-clock)# profile g.8265.1 clock-type slave
Router(config-ptp-clock)# commit
Router(config-ptp-clock)# exit

/* Configure network type as high PDV. */
Router(config-ptp)# network-type high-pdv
Router(config-ptp)# commit

```

Running Configuration

```

ptp
 clock
  domain 4
  profile g.8265.1 clock-type slave
 !
 network-type high-pdv
 !
 !

```

G.8275.1

Table 7: Feature History Table

Feature Name	Release Information	Feature Description
ITU-T G.8275.1 profile support	Release 7.3.1	This feature supports the architecture defined in ITU-T G.8275 for systems requiring accurate phase and time synchronisation, phase or time-of-day synchronization is required, and where each network device participates in the PTP protocol. Support of this capability is extended on the Cisco 8000 Series router, in this release.

G.8275.1 profile fulfills the time-of-day and phase synchronization requirements in telecom networks with all network devices participating in the PTP protocol. G.8275.1 profile provides better frequency stability for the time-of-day and phase synchronization.

Features of G.8275.1 profile are:

- Synchronization Model: G.8275.1 profile adopts hop-by-hop synchronization model. Each network device in the path from master to slave synchronizes its local clock to upstream devices and provides synchronization to downstream devices.
- Clock Selection: G.8275.1 profile also defines an alternate BMCA that selects a clock for synchronization and port state for the local ports of all devices in the network is defined for the profile. The parameters defined as a part of the BMCA are:
 - Clock Class
 - Clock Accuracy
 - Offset Scaled Log Variance
 - Priority 2
 - Clock Identity
 - Steps Removed
 - Port Identity
 - notSlave flag
 - Local Priority
- Port State Decision: The port states are selected based on the alternate BMCA algorithm. A port is configured to a master-only port state to enforce the port to be a master for multicast transport mode.
- Packet Rates: The nominal packet rate for Announce packets is 8 packets-per-second and 16 packets-per-second for Sync/Follow-Up and Delay-Request/Delay-Response packets.
- Transport Mechanism: G.8275.1 profile only supports Ethernet PTP transport mechanism.

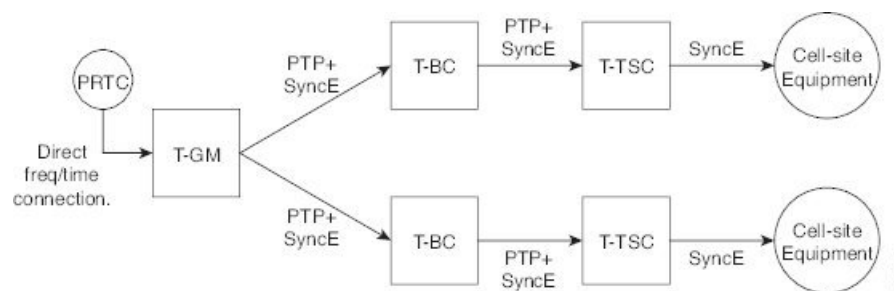
- Mode: G.8275.1 profile supports transport of data packets only in multicast mode. The forwarding is done based on forwardable or non-forwardable multicast MAC address.
- Clock Type: G.8275.1 profile supports the following clock types:
 - Telecom Grandmaster (T-GM): Provides timing for other network devices and does not synchronize its local clock to other network devices.
 - Telecom Time Slave Clock (T-TSC): A slave clock synchronizes its local clock to another PTP clock, but does not provide PTP synchronization to any other network devices.
 - Telecom Boundary Clock (T-BC): Synchronizes its local clock to a T-GM or an upstream T-BC clock and provides timing information to downstream T-BC or T-TSC clocks.
- Domain Numbers: The domain numbers that can be used in a G.8275.1 profile network ranges from 24 to 43. The default domain number is 24.

The G.8275.1 supports the following:

- T-GM: The telecom grandmaster (T-GM) provides timing to all other devices on the network. It does not synchronize its local clock with any other network element other than the Primary Reference Time Clock (PRTC).
- T-BC: The telecom boundary clock (T-BC) synchronizes its local clock to a T-GM or an upstream T-BC, and provides timing information to downstream T-BCs or T-TSCs. If at a given point in time there are no higher-quality clocks available to a T-BC to synchronize to, it may act as a grandmaster.
- T-TSC: The telecom time slave clock (T-TSC) synchronizes its local clock to another PTP clock (in most cases, the T-BC), and does not provide synchronization through PTP to any other device.

The following figure describes a sample G.8275.1 topology.

Figure 1: A Sample G.8275.1 Topology



Configuring Global G.8275.1 Profile

The following configuration describes the steps involved to create a global PTP configuration profile that can be applied at an interface level. It uses G.8275.1 profile as an example:

```
Router# config terminal
Router(config)# ptp
Router(config-ptp)# clock
Router(config-ptp-clock)# domain 24
Router(config-ptp-clock)# profile g.8275.1 clock-type T-BC
Router(config-ptp-clock)# exit
Router(config-ptp)# profile slave
```

```

Router(config-ptp-profile)# multicast target-address ethernet 01-1B-19-00-00-00
Router(config-ptp-profile)# transport ethernet
Router(config-ptp-profile)# sync frequency 16
Router(config-ptp-profile)# announce frequency 8
Router(config-ptp-profile)# delay-request frequency 16
Router(config-ptp-profile)# exit
Router(config-ptp)# profile master
Router(config-ptp-profile)# multicast target-address ethernet 01-1B-19-00-00-00
Router(config-ptp-profile)# transport ethernet
Router(config-ptp-profile)# sync frequency 16
Router(config-ptp-profile)# announce frequency 8
Router(config-ptp-profile)# delay-request frequency 16
Router(config-ptp-profile)# exit
Router(config-ptp)# physical-layer-frequency
Router(config-ptp)# log
Router(config-ptp-log)# servo events
Router(config-ptp-log)# commit

```

Verification

To display the configured PTP profile details, use **show run ptp** command.

```

Router# show run ptp

Wed Feb 28 11:16:05.943 UTC
ptp
 clock
  domain 24
  profile g.8275.1 clock-type T-BC
 !
profile slave
 multicast target-address ethernet 01-1B-19-00-00-00
 transport ethernet
 sync frequency 16
 announce frequency 8
 delay-request frequency 16
 !
profile master
 multicast target-address ethernet 01-1B-19-00-00-00
 transport ethernet
 sync frequency 16
 announce frequency 8
 delay-request frequency 16
 !
physical-layer-frequency
log
 servo events
 !

```

Configuring PTP Master Interface

The below configuration describes the steps involved to configure a PTP interface to be a Master.

```

Router# configure terminal
Router(config)# interface HundredGigE0/0/0/0
Router(config-if)# ptp
Router(config-if-ptp)# profile master
Router(config-if-ptp)# port state master-only
Router(config-if-ptp)# commit

```

Verification

To verify the port state details, use **show run interface** *interface-name* command.

```
Router# show run interface HundredGigE0/0/0/0
interface HundredGigE0/0/0/0
  ptp
  profile master
  port state master-only
!
```

Configuring PTP Slave Interface

This procedure describes the steps involved to configure a PTP interface to be a Slave.

```
Router# configure terminal
Router(config)# interface HundredGigE0/0/0/1
Router(config-if)# ptp
Router(config-if-ptp)# profile slave
Router(config-if-ptp)# port state slave-only
Router(config-if-ptp)# commit
```

Verification

To verify the port state details, use **show run interface** *interface-name* command.

```
Router# show run interface HundredGigE0/0/0/1
interface HundredGigE0/0/0/1
  ptp
  profile slave
  port state slave-only
!
```

Configuring PTP Hybrid Mode

This procedure describes the steps involved to configure router in a hybrid mode. You configure hybrid mode by selecting PTP for phase and time-of-day (ToD) and another source for the frequency.



-
- Note**
- G.8275.1 PTP profile supports only the hybrid mode. It is mandatory to have hybrid mode for G8275.1 profile for T-BC and T-TSC clock types. By default, the hybrid mode is used, regardless of the physical-layer-frequency configuration.
-

To configure PTP Hybrid mode:

1. Configure Global Frequency Synchronization

```
Router(config)# frequency synchronization
Router(config)# commit
```

2. Configure Frequency Synchronization for an Interface. The time-of-day-priority setting specifies that SyncE to be used as a ToD source if there is no source available with a lower priority.

```
Router(config)# interface HundredGigE 0/0/0/0
Router(config-if)# frequency synchronization
Router(config-if-freqsync)# selection input
Router(config-if-freqsync)# time-of-day-priority 100
Router(config-if-freqsync)# commit
```

Verification

```
Router # show frequency synchronization selection location 0/RP0/CP0
```

```
Tue Feb  6 06:34:17.627 UTC
Node 0/RP0/CPU0:
=====
Selection point: T0-SEL-B (3 inputs, 1 selected)
Last programmed 00:01:04 ago, and selection made 00:00:24 ago
Next selection points
SPA scoped : None
Node scoped : CHASSIS-TOD-SEL
Chassis scoped: LC_TX_SELECT
Router scoped : None
Uses frequency selection
Used for local line interface output
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
PTP [0/RP0/CPU0] n/a PRS 254 Available
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: T4-SEL (3 inputs, 1 selected)
Last programmed 00:01:04 ago, and selection made 00:00:24 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses frequency selection
Used for local clock interface output
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
PTP [0/RP0/CPU0] n/a PRS 254 Available
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: 1588-SEL (2 inputs, 1 selected)
Last programmed 00:01:04 ago, and selection made 00:00:24 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses frequency selection
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: CHASSIS-TOD-SEL (2 inputs, 1 selected)
Last programmed 00:00:53 ago, and selection made 00:00:51 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses time-of-day selection
S Input Last Selection Point Pri Time Status
== =====
1 PTP [0/RP0/CPU0] n/a 100 Yes Available
HundredGigE 0/0/0/0 0/RP0/CPU0 T0-SEL-B 1 100 No Available

RP0/RP0/CPU0:SF-D#
```

```

RP/0/RP0/CPU0:SF-D#
RP/0/RP0/CPU0:SF-D#show frequency synchronization selection location 0/RP0/CP$
Thu Jan 1 00:16:56.105 UTC
Node 0/RP0/CPU0:
=====
Selection point: T0-SEL-B (3 inputs, 1 selected)
Last programmed 00:01:09 ago, and selection made 00:00:29 ago
Next selection points
SPA scoped : None
Node scoped : CHASSIS-TOD-SEL
Chassis scoped: LC_TX_SELECT
Router scoped : None
Uses frequency selection
Used for local line interface output
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
PTP [0/RP0/CPU0] n/a PRS 254 Available
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: T4-SEL (3 inputs, 1 selected)
Last programmed 00:01:09 ago, and selection made 00:00:29 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses frequency selection
Used for local clock interface output
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
PTP [0/RP0/CPU0] n/a PRS 254 Available
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: 1588-SEL (2 inputs, 1 selected)
Last programmed 00:01:09 ago, and selection made 00:00:29 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses frequency selection
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: CHASSIS-TOD-SEL (2 inputs, 1 selected)
Last programmed 00:00:57 ago, and selection made 00:00:56 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses time-of-day selection
S Input Last Selection Point Pri Time Status
== =====
1 PTP [0/RP0/CPU0] n/a 100 Yes Available
HundredGigE 0/0/0/0 0/RP0/CPU0 T0-SEL-B 1 100 No Available

```

ITU-T Telecom Profile Examples:

G.8265.1 Profile Configuration Examples

Master Global Configuration:

```

frequency synchronization
  quality itu-t option 1
  log selection changes
!
ptp
  clock
  domain 4
  profile g.8265.1 clock-type master
!
  profile master
  transport ipv4
  sync frequency 64
  announce frequency 1
  delay-request frequency 64
interface HundredGigE 0/2/0/4
  ptp
  profile master
  port state master-only
!
  ipv4 address 18.1.1.1 255.255.255.0
!

```



Note For G.8265.1 PTP master clock, either SyncE or BITS reference source configuration is recommended. Otherwise, the device uses its own internal clock.

Slave Global Configuration:

```

frequency synchronization
  quality itu-t option 1
  log selection changes
!
ptp
  clock
  domain 4
  profile g.8265.1 clock-type slave
!
  profile slave
  transport ipv4
  sync frequency 64
  announce interval 1
  delay-request frequency 64
interface HundredGigE 0/1/0/0
  ptp
  profile slave
  Master ipv4 18.1.1.1
  port state slave-only
!
  ipv4 address 18.1.1.2/24

```


G.8275.1

Table 8: Feature History Table

Feature Name	Release Information	Feature Description
ITU-T G.8275.1 profile support	Release 7.3.1	This feature supports the architecture defined in ITU-T G.8275 for systems requiring accurate phase and time synchronisation, phase or time-of-day synchronization is required, and where each network device participates in the PTP protocol. Support of this capability is extended on the Cisco 8000 Series router, in this release.

G.8275.1 profile fulfills the time-of-day and phase synchronization requirements in telecom networks with all network devices participating in the PTP protocol. G.8275.1 profile provides better frequency stability for the time-of-day and phase synchronization.

Features of G.8275.1 profile are:

- Synchronization Model: G.8275.1 profile adopts hop-by-hop synchronization model. Each network device in the path from master to slave synchronizes its local clock to upstream devices and provides synchronization to downstream devices.
- Clock Selection: G.8275.1 profile also defines an alternate BMCA that selects a clock for synchronization and port state for the local ports of all devices in the network is defined for the profile. The parameters defined as a part of the BMCA are:
 - Clock Class
 - Clock Accuracy
 - Offset Scaled Log Variance
 - Priority 2
 - Clock Identity
 - Steps Removed
 - Port Identity
 - notSlave flag
 - Local Priority
- Port State Decision: The port states are selected based on the alternate BMCA algorithm. A port is configured to a master-only port state to enforce the port to be a master for multicast transport mode.
- Packet Rates: The nominal packet rate for Announce packets is 8 packets-per-second and 16 packets-per-second for Sync/Follow-Up and Delay-Request/Delay-Response packets.
- Transport Mechanism: G.8275.1 profile only supports Ethernet PTP transport mechanism.

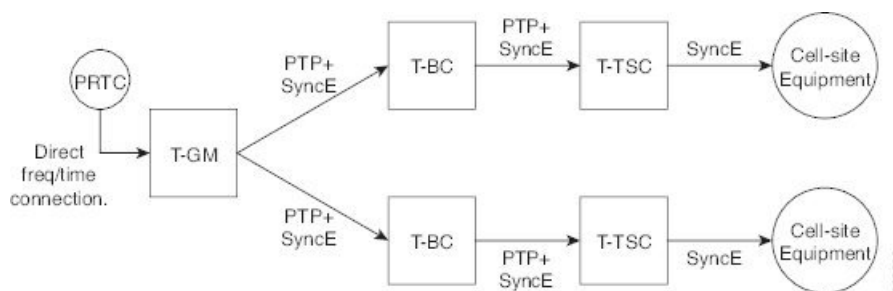
- Mode: G.8275.1 profile supports transport of data packets only in multicast mode. The forwarding is done based on forwardable or non-forwardable multicast MAC address.
- Clock Type: G.8275.1 profile supports the following clock types:
 - Telecom Grandmaster (T-GM): Provides timing for other network devices and does not synchronize its local clock to other network devices.
 - Telecom Time Slave Clock (T-TSC): A slave clock synchronizes its local clock to another PTP clock, but does not provide PTP synchronization to any other network devices.
 - Telecom Boundary Clock (T-BC): Synchronizes its local clock to a T-GM or an upstream T-BC clock and provides timing information to downstream T-BC or T-TSC clocks.
- Domain Numbers: The domain numbers that can be used in a G.8275.1 profile network ranges from 24 to 43. The default domain number is 24.

The G.8275.1 supports the following:

- T-GM: The telecom grandmaster (T-GM) provides timing to all other devices on the network. It does not synchronize its local clock with any other network element other than the Primary Reference Time Clock (PRTC).
- T-BC: The telecom boundary clock (T-BC) synchronizes its local clock to a T-GM or an upstream T-BC, and provides timing information to downstream T-BCs or T-TSCs. If at a given point in time there are no higher-quality clocks available to a T-BC to synchronize to, it may act as a grandmaster.
- T-TSC: The telecom time slave clock (T-TSC) synchronizes its local clock to another PTP clock (in most cases, the T-BC), and does not provide synchronization through PTP to any other device.

The following figure describes a sample G.8275.1 topology.

Figure 2: A Sample G.8275.1 Topology



Configuring Global G.8275.1 Profile

The following configuration describes the steps involved to create a global PTP configuration profile that can be applied at an interface level. It uses G.8275.1 profile as an example:

```

Router# config terminal
Router(config)# ptp
Router(config-ptp)# clock
Router(config-ptp-clock)# domain 24
Router(config-ptp-clock)# profile g.8275.1 clock-type T-BC
Router(config-ptp-clock)# exit
Router(config-ptp)# profile slave
  
```

```

Router(config-ptp-profile)# multicast target-address ethernet 01-1B-19-00-00-00
Router(config-ptp-profile)# transport ethernet
Router(config-ptp-profile)# sync frequency 16
Router(config-ptp-profile)# announce frequency 8
Router(config-ptp-profile)# delay-request frequency 16
Router(config-ptp-profile)# exit
Router(config-ptp)# profile master
Router(config-ptp-profile)# multicast target-address ethernet 01-1B-19-00-00-00
Router(config-ptp-profile)# transport ethernet
Router(config-ptp-profile)# sync frequency 16
Router(config-ptp-profile)# announce frequency 8
Router(config-ptp-profile)# delay-request frequency 16
Router(config-ptp-profile)# exit
Router(config-ptp)# physical-layer-frequency
Router(config-ptp)# log
Router(config-ptp-log)# servo events
Router(config-ptp-log)# commit

```

Verification

To display the configured PTP profile details, use **show run ptp** command.

```

Router# show run ptp

Wed Feb 28 11:16:05.943 UTC
ptp
 clock
  domain 24
  profile g.8275.1 clock-type T-BC
 !
profile slave
 multicast target-address ethernet 01-1B-19-00-00-00
 transport ethernet
 sync frequency 16
 announce frequency 8
 delay-request frequency 16
 !
profile master
 multicast target-address ethernet 01-1B-19-00-00-00
 transport ethernet
 sync frequency 16
 announce frequency 8
 delay-request frequency 16
 !
physical-layer-frequency
log
 servo events
 !

```

Configuring PTP Master Interface

The below configuration describes the steps involved to configure a PTP interface to be a Master.

```

Router# configure terminal
Router(config)# interface HundredGigE0/0/0/0
Router(config-if)# ptp
Router(config-if-ptp)# profile master
Router(config-if-ptp)# port state master-only
Router(config-if-ptp)# commit

```

Verification

To verify the port state details, use **show run interface** *interface-name* command.

```
Router# show run interface HundredGigE0/0/0/0
interface HundredGigE0/0/0/0
  ptp
  profile master
  port state master-only
!
```

Configuring PTP Slave Interface

This procedure describes the steps involved to configure a PTP interface to be a Slave.

```
Router# configure terminal
Router(config)# interface HundredGigE0/0/0/1
Router(config-if)# ptp
Router(config-if-ptp)# profile slave
Router(config-if-ptp)# port state slave-only
Router(config-if-ptp)# commit
```

Verification

To verify the port state details, use **show run interface** *interface-name* command.

```
Router# show run interface HundredGigE0/0/0/1
interface HundredGigE0/0/0/1
  ptp
  profile slave
  port state slave-only
!
```

Configuring PTP Hybrid Mode

This procedure describes the steps involved to configure router in a hybrid mode. You configure hybrid mode by selecting PTP for phase and time-of-day (ToD) and another source for the frequency.



Note

- G.8275.1 PTP profile supports only the hybrid mode. It is mandatory to have hybrid mode for G8275.1 profile for T-BC and T-TSC clock types. By default, the hybrid mode is used, regardless of the physical-layer-frequency configuration.

To configure PTP Hybrid mode:

1. Configure Global Frequency Synchronization

```
Router(config)# frequency synchronization
Router(config)# commit
```

2. Configure Frequency Synchronization for an Interface. The time-of-day-priority setting specifies that SyncE to be used as a ToD source if there is no source available with a lower priority.

```
Router(config)# interface HundredGigE 0/0/0/0
Router(config-if)# frequency synchronization
Router(config-if-freqsync)# selection input
Router(config-if-freqsync)# time-of-day-priority 100
Router(config-if-freqsync)# commit
```

Verification

```
Router # show frequency synchronization selection location 0/RP0/CP0
```

```
Tue Feb  6 06:34:17.627 UTC
Node 0/RP0/CPU0:
=====
Selection point: T0-SEL-B (3 inputs, 1 selected)
Last programmed 00:01:04 ago, and selection made 00:00:24 ago
Next selection points
SPA scoped : None
Node scoped : CHASSIS-TOD-SEL
Chassis scoped: LC_TX_SELECT
Router scoped : None
Uses frequency selection
Used for local line interface output
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
PTP [0/RP0/CPU0] n/a PRS 254 Available
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: T4-SEL (3 inputs, 1 selected)
Last programmed 00:01:04 ago, and selection made 00:00:24 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses frequency selection
Used for local clock interface output
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
PTP [0/RP0/CPU0] n/a PRS 254 Available
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: 1588-SEL (2 inputs, 1 selected)
Last programmed 00:01:04 ago, and selection made 00:00:24 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses frequency selection
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: CHASSIS-TOD-SEL (2 inputs, 1 selected)
Last programmed 00:00:53 ago, and selection made 00:00:51 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses time-of-day selection
S Input Last Selection Point Pri Time Status
== =====
1 PTP [0/RP0/CPU0] n/a 100 Yes Available
HundredGigE 0/0/0/0 0/RP0/CPU0 T0-SEL-B 1 100 No Available

RP/0/RP0/CPU0:SF-D#
```

```

RP/0/RP0/CPU0:SF-D#
RP/0/RP0/CPU0:SF-D#show frequency synchronization selection location 0/RP0/CP$
Thu Jan 1 00:16:56.105 UTC
Node 0/RP0/CPU0:
=====
Selection point: T0-SEL-B (3 inputs, 1 selected)
Last programmed 00:01:09 ago, and selection made 00:00:29 ago
Next selection points
SPA scoped : None
Node scoped : CHASSIS-TOD-SEL
Chassis scoped: LC_TX_SELECT
Router scoped : None
Uses frequency selection
Used for local line interface output
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
PTP [0/RP0/CPU0] n/a PRS 254 Available
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: T4-SEL (3 inputs, 1 selected)
Last programmed 00:01:09 ago, and selection made 00:00:29 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses frequency selection
Used for local clock interface output
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
PTP [0/RP0/CPU0] n/a PRS 254 Available
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: 1588-SEL (2 inputs, 1 selected)
Last programmed 00:01:09 ago, and selection made 00:00:29 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses frequency selection
S Input Last Selection Point QL Pri Status
== =====
1 HundredGigE 0/0/0/0 0/2/CPU0 ETH_RXMUX 1 ePRTC 1 Locked
Internal0 [0/RP0/CPU0] n/a ST3E 255 Available

Selection point: CHASSIS-TOD-SEL (2 inputs, 1 selected)
Last programmed 00:00:57 ago, and selection made 00:00:56 ago
Next selection points
SPA scoped : None
Node scoped : None
Chassis scoped: None
Router scoped : None
Uses time-of-day selection
S Input Last Selection Point Pri Time Status
== =====
1 PTP [0/RP0/CPU0] n/a 100 Yes Available
HundredGigE 0/0/0/0 0/RP0/CPU0 T0-SEL-B 1 100 No Available

```