Cisco Nexus 9000 Hybrid PTP Platform

New and Changed Information

The following table provides an overview of the changes to the organization and content of this guide up to the current release.

Table 1: New and Changed Information

Release	Feature or Change Description	Where Documented
9.3(5)	First release of this document	

Hybrid PTP Platform Overview

Beginning with Cisco NX-OS Release 9.3(5), a hybrid SyncE-PTP topology is supported to achieve the end-to-end network precision frequency required for circuit emulation and cell tower frequency referring.

The following figure shows the topology with the external timing source as the grandmaster clock (T-GM). The T-GM provides the timing source for the Telecom Boundary Clocks (T-BCs).

Figure 1: Hybrid PTP with External Primary Reference Clock Source
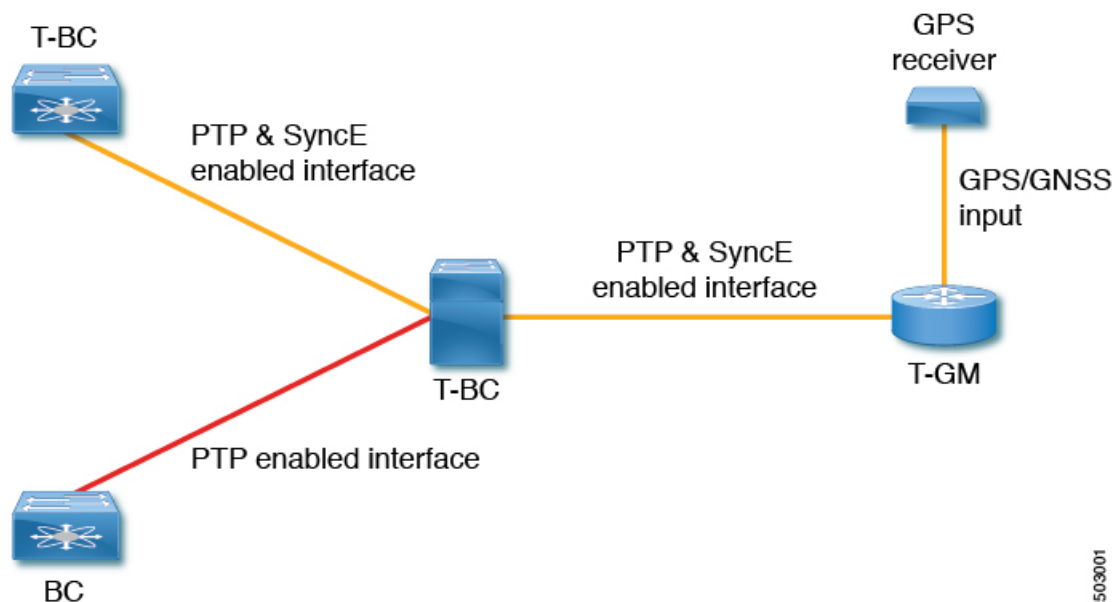
Telecom Grandmaster (T-GM): Provides timing for other network devices and does not synchronize its local clock to other network devices.

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.

Guidelines and Limitations

PTP Telecom Profile Guidelines and Limitations

PTP Telecom Profile has the following guidelines and limitations:

- PTP Telecom Profile is supported only on the Cisco Nexus N9K-C93180YC-FX3S switch.

- 1 Pulse per Second (1PPS) output is enabled by default. UTC/SMB port is in output mode and hence 1PPS output is enabled.

- Only PTP class B is supported

- Only Telecom Boundary Clock (T-BC) is supported

- Cisco's Telecom Profile G.8273.2 feature is compliant with the ITU-T *G.8273.2 : Timing characteristics of telecom boundary clocks and telecom time slave clocks* standard with the exception that 1PPS output is not aligned with PTP.

- TOD output is not supported

Note   Time of Day and PTP GM are not supported in Cisco NX-OS Release 9.3(5).

Frequency Synchronization Guidelines and Limitations

Frequency Synchronization has the following guidelines and limitations:

- SyncE is supported only on the Cisco Nexus N9K-C93180YC-FX3S switch.

- SyncE is supported only on physical interfaces.

- A maximum four ethernet interfaces can be monitored for SyncE selection input at any given instance of time.

- Each quad port group on the PHY provides one reference clock.

- Only one Ethernet interface from each quad port group can be configured as a SyncE input (one reference clock for each port group). There is no restriction on SyncE outputs.

- SyncE must be enabled explicitly on the member interfaces for a port-channel. If a member interface of a port-channel is locked as a SyncE source, the ability to send out DNU on other member interfaces enabled for SyncE is controlled via the global command **fsync transmit dnu lag-members**.

- Only G.8275.1 hybrid profile in BC mode is supported.

- For a list of qualified optics for this release, see the Cisco Optics Compatibility Matrix.

Note   GPS and GNSS are not supported in Cisco NX-OS Release 9.3(5).

Configuring PTP Globally

This procedure describes the steps involved to configure PTP telecom profile including the clock and its settings to be consistent with ITU-T Telecom Profiles for Frequency.

Before you begin

The QoS TCAM region Ingress SUP [ingress-sup] must be set to 768 or higher. Follow these steps:

1. Check the TCAM region by using the **show hardware access-list tcam region** command.

2. If the Ingress SUP region is not set to 768 or higher, then configure the Ingress SUP TCAM region using the command **hardware access-list tcam region ing-sup 768**. Copy the running configuration to the startup configuration (**copy running-config startup-config**) and reload the switch.

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	Required: **feature ptp**
	Example:
	`switch(config)# feature ptp`
	`switch(config)#`
		Enables the global PTP feature.

Step 3	Required: **ptp profile** { **8275-1** | **default** }
	Example:
	`switch(config)# ptp profile 8275-1`
	`switch(config-ptp-profile)#`
		Enables a PTP profile and enters the PTP profile configuration mode. For more information about the commands supported through the profile types in this command, see
		
		Note 8275.1 supports the PTP Telecom Profile configuration.
		
		                For Cisco NX-OS Release 9.3(5), only the Cisco Nexus N9K-C93180YC-FX3S supports either option in this command.

Step 4	Profile Default: **mode** { **hybrid** | **non-hybrid** | **none** }
	Example:
	`switch(config)# mode hybrid`
	`switch(config-ptp-profile)#`
		Configures the PTP operational mode for the switch:
		
		hybrid: The SyncE source acts as the PTP source.
		
		default: The local/1588 clock acts as the PTP source.
		
		Note This command is automatically configured when the **ptp profile** command is set. The configuration value cannot be changed. See Step 3, on page 4 for more information.

	Command or Action	Purpose

Step 5	**exit**
	
	Example:
	
	`switch(config-ptp-profile)# exit`
	`switch(config)#`
		Exits the PTP profile configuration mode and returns to the global configuration mode.

Step 6	**ptp source** *ip-address*
	
	Example:
	
	`switch(config)# ptp source 0.0.0.0`
	`switch(config)#`
		Configures the source IPv4 address for all the PTP packets in the multicast PTP mode.

Step 7	Profile Default: **ptp priority1** *value*
	
	Example:
	
	`switch(config)# ptp priority1 128`
	`switch(config)#`
		Configures the priority1 value to use when advertising this clock. This value overrides the default criteria (clock quality, clock class, etc.) for best master clock selection. Lower values take precedence.
		
		Note This command is automatically configured when the **ptp profile** command is set. The configuration value cannot be changed. See Step 3, on page 4 for more information.

Step 8	Profile Default: **ptp priority2** *value*
	
	Example:
	
	`switch(config)# ptp priority2 128`
	`switch(config)#`
		Configures the priority2 value to use when advertising this clock. This value overrides the default criteria (clock quality, clock class, etc.) for best master clock selection. Lower values take precedence.
		
		Note This command is automatically configured when the **ptp profile** command is set. The configuration value cannot be changed. See Step 3, on page 4 for more information.

Step 9	**ptp pdelay-req-interval** *value*
	
	Example:
	
	`switch(config)# ptp pdelay-req-interval 0`
	`switch(config)#`
		Configures the peer delay request interval.
		
		value: Range is from 0 through 5.

Step 10	Profile Default: **ptp domain** *value*
	
	Example:
	
	`switch(config)# ptp domain 24`
	`switch(config)#`
		Specifies the PTP clock domain value.
		
		Note This command is automatically configured when the **ptp profile** command is set. The configuration value cannot be changed. See Step 3, on page 4 for more information.

Configuring PTP on an Interface

This procedure describes the steps that are involved to configure PTP telecom profile for interfaces.

> **Note** Some commands that are described in this procedure are automatically enabled and configured when the **ptp profile 8275-1** global command is set. See Configuring PTP Globally, on page 4 for more information.

Before you begin

This procedure along with configuring frequency synchronization on the interface, constitutes the required interface settings for the "hybrid PTP" platform. For more information regarding the interface frequency synchronization configuration, see .

Procedure

	Command or Action	**Purpose**

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface ethernet** *slot* / *port*
	Example:
	`switch(config)# interface ethernet 1/5`
	`switch(config-if)#`
		Specifies the interface on which you are configuring PTP telecom profile parameters and enters the interface configuration mode.

Step 3	[**no**] **ptp**
	Example:
	`switch(config-if)# ptp`
	`switch(config-if)#`
		Enables PTP on the interface.

Step 4	Profile Default: **ptp transport ethernet**
	Example:
	`switch(config-if)# ptp transport ethernet`
	`switch(config-if)#`
		Specifies the transport mechanism that is used to send PTP packets. For **etnernet**, PTP packets are carried only in Eth frame (Eth/ptp).
		Note This command is automatically configured when the **ptp profile 8275-1** global command is set. For more information about the **ptp profile 8275-1** command, see Configuring PTP Globally, on page 4.

Step 5	Profile Default: **ptp transmission multicast**
	Example:
	`switch(config-if)# ptp transmission multicast`
	`switch(config-if)#`
		Configures the PTP transmission method that is used by the interface. For **multicast**, PTP uses multicast destination IP address 224.0.1.129 as per IEEE 1588 standards for communication between devices.
		Note This command is automatically configured when the **ptp profile 8275-1** global command is set. For more information about the **ptp profile 8275-1** command, see Configuring PTP Globally, on page 4.

	Command or Action	Purpose
Step 6	Profile Default: **ptp role dynamic** **Example:** switch(config-if)# ptp role dynamic switch(config-if)#	Configures the PTP role of the interface. For **dynamic**, the best master clock algorithm (BMCA) assigns the role. **Note** This command is automatically configured when the **ptp profile 8275-1** global command is set. For more information about the **ptp profile 8275-1** command, see Configuring PTP Globally, on page 4.
Step 7	(Optional) **ptp destination-mac non-forwardable rx-no-match accept** **Example:** switch(config-if)# ptp destination-mac non-forwardable rx-no-match accept switch(config-if)#	Accepts and responds to non-forwardable destination MAC address packets. These destination MAC addresses are used in the PTP messages that are exchanged between the GM clock, PTP-master clock, and PTP-slave clocks.
Step 8	Profile Default: **ptp cost** *value* **Example:** switch(config-if)# ptp cost 128 switch(config-if)#	Configures the value to be used in the BMCA's selection of the best master clock. If all the parameters mentioned in the standard are the same, then this local priority is used. **Note** This command is automatically configured when the **ptp profile 8275-1** global command is set. For more information about the **ptp profile 8275-1** command, see Configuring PTP Globally, on page 4.
Step 9	Profile Default: **ptp delay-request minimum interval** *log-seconds* **Example:** switch(config-if)# ptp delay-request minimum interval -4 switch(config-if)#	Configures the minimum interval that is allowed between PTP delay messages when the port is in the master state. **Note** This command is automatically configured when the **ptp profile 8275-1** global command is set. For more information about the **ptp profile 8275-1** command, see Configuring PTP Globally, on page 4.
Step 10	Profile Default: **ptp announce interval** *log-seconds* **Example:** switch(config-if)# ptp announce interval 3 switch(config-if)#	Configures the interval between PTP announce messages on an interface or the number of PTP intervals before a timeout occurs on an interface. **Note** This command is automatically configured when the **ptp profile 8275-1** global command is set. For more information about the **ptp profile 8275-1** command, see Configuring PTP Globally, on page 4.
Step 11	Profile Default: **ptp sync interval** *log-seconds* **Example:**	Configures the interval between PTP synchronization messages on an interface.

	Command or Action	Purpose
	`switch(config-if)# ptp sync interval 1` `switch(config-if)#`	**Note** This command is automatically configured when the **ptp profile 8275-1** global command is set. For more information about the **ptp profile 8275-1** command, see Configuring PTP Globally, on page 4.

Step 12	(Optional) [**no**] **ptp announce timeout** *count*
	Example:
	`switch(config-if)# ptp announce timeout 3`
	`switch(config-if)`
		Configures the number of PTP intervals before a timeout occurs on an interface.
		The range for the interval timeout is from 2 to 4 intervals.

Step 13	(Optional) [**no**] **ptp profile-override**
	Example:
	`switch(config-if)# ptp profile-override`
	`switch(config-if)#`
		Disabled by default, when enabled, allows you to change the following commands in this interface configuration:
		
		  • **ptp transport**
		  • **ptp announce interval**
		  • **ptp delay-request minimum interval**
		  • **ptp sync interval**
		  • **ptp cost** (8275.1 profile only)
		
		Note When enabled, changes to the commands will not be reset to default if the global PTP profile is changed. Removing **ptp profile-override** resets the PTP configuration on the interface to the default values corresponding to the global profile.

PTP Profile Defaults

The following table lists the ranges and default values for the commands that are automatically configured when the global command **ptp profile** is set. You cannot change the range for the affected global commands beyond those allowed by the configured profile. However, in the interface mode, they can be changed if the **ptp profile-override** command is set.

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Note For Cisco NX-OS Release 9.3(5), only the Cisco Nexus N9K-C93180YC-FX3S supports either option in this command.

Table 2: Range and Default Values

Parameter	Scope or Configuration Mode	Default Profile's Supported Range of Values	Default Profile's Default Value	8275.1 Profile's Supported Range of Values	8275.1 Profile's Default Value	With 'ptp profile-override' Configured on an Interface Supported Range of Values (Default is Based on Configured Profile)
mode	global	none	none	hybrid	hybrid	no change
domain	global	0 to 63	0	24 to 43	24	no change
priority1	global	0 to 255	255	128	128	no change
priority2	global	0 to 255	255	0 to 255	128	no change
cost	interface	Not configurable	Not configurable	0 to 255	128	0 to 255
transport	interface	ipv4	ipv4	ethernet	ethernet	ethernet, ipv4
transmission	interface	multicast, unicast	multicast	multicast	multicast	no change
role	interface	dynamic, master, slave	dynamic	dynamic	dynamic	no change
announce interval	interface	0 to 4 0 to 4 with aes67 -3 to 1 with smpte-2059-2	1	-3	-3	-3 to 4 0 to 4 with aes67 -3 to 1 with smpte-2059-2
delay-request minimum interval	interface	-1 to 6 -4 to 5 with aes67 -4 to 5 with smpte-2059-2	0	-4	-4	-4 to 6 -4 to 5 with aes67 -4 to 5 with smpte-2059-2
sync interval	interface	-3 to 1 -4 to 1 with aes67 -7 to 0 with smpte-2059-2	-2	-4	-4	-4 to 1 -4 to 1 with aes67 -7 to 0 with smpte-2059-2

Licensing Requirements for Synchronous Ethernet (SyncE)

Product	License Requirement
Cisco NX-OS	Install the SyncE add-on license. For a complete explanation of the Cisco NX-OS licensing scheme, see the Cisco NX-OS Licensing Guide.

Enabling Frequency Synchronization

Use this procedure to enable frequency synchronization, set the quality level of the switch, identify the clock ID for ESMC extended TLV, and configure the ESMC peer timeout for software upgrades.

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	[**no**] **feature frequency-synchronization**
	
	Example:
	`switch(config)# feature frequncy-synchronization`
	`switch(config)#`
		Enables frequency synchronization on the switch.

Step 3	[**no**] **fsync quality itu-t option**{ **1** | **2 generation** { **1** | **2** } }
	
	Example:
	`switch(config)# fsync quality itu-t option 1`
	`switch(config)#`
		Specifies the quality level for the switch. The default is **option 1**.
		
		• **option 1** - Includes DNU, EEC1, PRC, PRTC, SEC, SSU-A, SSU-B, eEEC and ePRTC.
		
		• **option 2 generation 1** - Includes DUS, EEC2, PRS, PRTC, RES, SMC, ST2, ST3, ST4, STU, eEEC and ePRTC.
		
		• **option 2 generation 2** - Includes DUS, EEC2, PROV, PRS, PRTC, SMC, ST2, ST3, ST3E, ST4, STU, TNC, eEEC and ePRTC.
		
		Note The quality option that is configured here must match the quality option that is specified in the **quality receive** and **quality transmit** commands in the interface frequency synchronization configuration mode.

Step 4	**fsync clock-identity** *mac-address* | **no fsync clock-identity**	Specifies the clock ID to be used for Ethernet Synchronization Message Channel (ESMC) extended TLV.

	Command or Action	Purpose

	Example:
	`switch(config)# fsync clock-identity`
	`AB:CD:EF:12:34:56`
	`switch(config)#`
		If no clock ID is configured, the system uses the default VDC MAC address.

Step 5	[**no**] **fsync esmc peer receive timeout**{ **0**	*value*}
		Example:
		`switch(config)# fsync esmc peer receive timeout`
		`120`
		`switch(config)#`
			Specifies the ESMC peer receive timeout during ISSU.
			0 disables the ESMC peer receive timeout.
			value is the ESMC receive timeout in seconds. Enter a value from 120 through 600. Default = 120.
			This command ensures that the ESMC control plane, and thus, selection, is not removed during software upgrade for a period of the *value*.

Step 6	[**no**] **fsync transmit dnu lag-members**
	Example:
	`switch(config)# fsync transmit dnu lag-members`
	`switch(config)#`
		SyncE must be enabled explicitly on the member interfaces for a port-channel. If a member interface of a port-channel is locked as a SyncE source, the ability to send out DNU (Do Not Use) QLs on other member interfaces that are enabled for SyncE is controlled by this command.
		If enabled and an interface that is driving the clock for the switch is part of a port-channel, then any members of the port-channel will also send out DNU QL if SyncE is enabled on that interface.
		If disabled, the system drives the QL of the selected source on all interfaces regardless of whether they are in the same port-channel as the interface driving the clock.

Step 7	(Optional) **copy running-config startup-config**
	Example:
	`switch(config)# copy running-config startup-config`
	`switch(config)#`
		Copies the running configuration to the startup configuration.

Configuring Frequency Synchronization on an Interface

Use this procedure to configure frequency synchronization on a specific interface.

Before you begin

This procedure along with configuring PTP telecom profile on the same interface, constitutes the required interface settings for the "hybrid PTP" platform. For more information about the interface PTP telecom profile configuration, see Configuring PTP on an Interface, on page 5.

Make sure that you have globally enabled frequency synchronization on the device (global configuration command **feature frequency-synchronization**).

Procedure

	Command or Action	**Purpose**

Step 1	**configure terminal**
	
	Example:
	
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	[**no**] **interface ethernet** *slot* / *port*
	
	Example:
	
	`switch(config)# interface ethernet 1/5`
	`switch(config-if)#`
		Specifies the interface on which you are enabling frequency synchronization and enters the interface configuration mode.

Step 3	[**no**] **frequency synchronization**
	
	Example:
	
	`switch(config-if)# frequency synchronization`
	`switch(config-if-freqsync)#`
		Enables frequency synchronization on the interface and enters the interface frequency synchronization configuration mode. The system selects the frequency signal to be used for clocking transmission, but does not enable the use of the interface as an input.
		
		Note The **no** form of the command functions only if there is no configuration present under the frequency synchronization configuration mode.

Step 4	[**no**] **selection input**
	
	Example:
	
	`switch(config-if-freqsync)# selection input`
	`switch(config-if-freqsync)#`
		Specifies the interface as a timing source to be passed to the selection algorithm.

Step 5	[**no**] **ssm disable**
	
	Example:
	
	`switch(config-if-freqsync)# ssm disable`
	`switch(config-if-freqsync)#`
		Disables sending ESMC packets and ignores any received ESMC packets.

Step 6	[**no**] **quality** { **receive** | **transmit** } { **exact** | **highest** | **lowest** } **itu-t option** *ql-option ql*
	
	Example:
	
	`switch(config-if-freqsync)# quality receive exact itu-t option 1 PRC`
	`switch(config-if-freqsync)#`
		Adjusts the Quality Level (QL) value that is used in received or transmitted SSMs, before it is used in the selection algorithm. Each timing source has a QL associated with it which provides the accuracy of the clock. This QL information is transmitted across the network via SSMs over the Ethernet Synchronization Messaging Channel (ESMC) so that devices can know the best available source to use for synchronization.
		
		• **exact** *ql*: Specifies the exact QL regardless of the value that is received, unless the received value is DNU.
		
		• **highest** *ql*: Specifies an upper limit on the received QL. If the received value is higher than this specified QL, this QL is used instead.

	Command or Action	Purpose
		• **lowest** *ql*: Specifies a lower limit on the received QL. If the received value is lower than this specified QL, DNU is used instead. **Note** The quality option that is specified in this command must match the globally configured quality option in the **quality itu-t option** command.

Step 7	[**no**] **priority** *value*
	
	Example:
	`switch(config-if-freqsync)# priority 100`
	`switch(config-if-freqsync)#`
		Configures the priority of the frequency source on the interface. This priority is used in the clock-selection algorithm to choose between two sources that have the same QL. Values range from 1 (highest priority) to 254 (lowest priority). The default value is 100.
		
		Note This command is valid only if **selection input** is configured.

Step 8	[**no**] **wait-to-restore** *minutes*
	
	Example:
	`switch(config-if-freqsync)# wait-to-restore 0`
	`switch(config-if-freqsync)#`
		Configures the wait-to-restore time, in minutes, for frequency synchronization on the interface. *minutes* is the amount of time after the interface initializes before it is used for synchronization. Values range from 0 to 12. The default value is 5.
		
		Note This command is valid only if **selection input** is configured.

Verifying the Configuration

This section contains example outputs from show commands used to verify the Frequency Synchronization and PTP Telecom Profile configuratrions.

Verifying the Frequency Synchronization Configuration

After performing the frequency synchronization configuration tasks, use this reference to check for configuration errors and verify the configuration.

show frequency synchronization configuration errors

The output of this command displays errors in the frequency synchronization configuration.

The following example shows the mismatch between the global **quality itu-t option** and the interface **quality receive itu-t option**:

```
switch# show frequency synchronization configuration errors

Elysian2(config)# show frequency synchronization configuration errors
Ethernet1/9
    quality receive exact itu-t option 1 PRC
* The QL that is configured is from a different QL option set than is
configured globally.
```

```
!Command: show running-config fsync_mgr all
!Running configuration last done at: Mon Feb 10 06:06:15 2020
!Time: Mon Feb 10 06:09:18 2020

version 9.3(5) Bios:version 00.04
feature frequency-synchronization

fsync quality itu-t option 2 generation 1 << must be the same as interface
fsync clock-identity 0
fsync esmc peer receive timeout 120

interface Ethernet1/9
  frequency synchronization
    selection input
    ssm disable
    quality receive exact itu-t option 1 PRC << must be the same as global
    priority 100
    wait-to-restore 0

interface Ethernet1/13
  frequency synchronization
    selection input
    ssm disable
    quality receive exact itu-t option 1 PRC
    priority 110
    wait-to-restore 0
```

show running-config fsync_mgr all

The output of this command displays the current frequency synchronization configuration on the device.

The following is an example of the output of the **show running-config fsync_mgr all** command:

```
switch# show running-config fsync_mgr all

feature frequency-synchronization

fsync quality itu-t option 1
fsync clock-identity 0
fsync esmc peer receive timeout 120

interface Ethernet1/9
  frequency synchronization
    selection input
    ssm disable
    quality receive exact itu-t option 1 PRC
   priority 100
    wait-to-restore 0

interface Ethernet1/13
  frequency synchronization
    selection input
    priority 100
    wait-to-restore 0
```

show frequency synchronization interface brief

The output of this command displays all interfaces that have frequency synchronization configured. Sources that have been nominated as inputs have 'S' in the Flags (Fl) column. Sources that have not been nominated as inputs do not have 'S' displayed.

The following is an example of the output of the **show frequency synchronization interface brief** command:

```
switch# show frequency synchronization interface brief

Flags:  > - Up              D - Down              S - Assigned for selection
        d - SSM Disabled     x - Peer timed out    i - Init state
        e - SSM Enabled      s - Output squelched
Fl    Interface         QLrcv QLuse Pri QLsnd Output driven by
===== ================= ===== ===== === ===== =======================
>S    Eth1/9            PRC   PRC   100 PRC   Eth1/13
>Sds  Eth1/13           n/a   PRC   100 n/a   Eth1/13
```

show frequency synchronization interface ethernet

The output of this command displays individual (user-selected) interfaces with associated frequency synchronization information.

The following is an example of the output of the **show frequency synchronization interface ethernet** *slot* / *port* command:

```
switch# show frequency synchronization interface ethernet 1/9

Inteface State:UP
Assigned as input for Selection
  Wait-to-restore time 0 minute(s)
  SSM Enabled
    Peer Up for 00:07:01, last SSM received 0.307s ago
    Peer has come up 4 times and timed out 1 times
    ESMC SSMs       Total   Information    Event    DNU/DUS
      Sent:         1097        1088          9         83
      Received:      823         816          7        155
  Input:
    Up
    Last received QL: PRC
    Effective QL: PRC, Priority: 100
    Originator clock ID: ffffffffffebfa543
    SyncE steps: 1, eSyncE steps: 1
    Not all steps run eSyncE; Chain of extended ESMC data is broken
    Supports frequency
  Output:
    Selected source: Eth1/13
    Selected source QL: PRC
    Effective QL: PRC
    Originator clock ID: ffffffffffebfa863
    SyncE steps: 1, eSyncE steps: 1
    Not all steps run eSyncE; Chain of extended ESMC data is broken
  Next selection points:
```

show frequency synchronization selection (with PTP Profile 8275-1)

The output of this command displays the detailed view of the different selection points within the system.

> **Note** This example shows the output when PTP profile 8275-1 <u>is</u> configured.

The following is an example of the output of the **show frequency synchronization selection** *slot* / *port* command:

```
switch# show frequency synchronization selection
==============
Selection point: System Clock (T0) Selector (3 inputs, 1 selected)
  Last programmed 18.898s ago, and selection made 8.621s ago
  Next selection points
    Node scoped   :
```

```
  Uses frequency selection
  Used for local line interface output
  S  Input                     Last Selection Point        QL  Pri  Status
  == ======================    ======================     ====== ==== ===========
  11 Ethernet1/9               n/a                         PRC   99  Locked
     Ethernet1/13              n/a                         PRC  100  Available
     Internal0[1]              n/a                         SEC  255  Available
==============
Selection point: IEEE 1588 Clock Selector (3 inputs, 1 selected)
  Last programmed 18.898s ago, and selection made 18.626s ago
  Next selection points
    Node scoped   :
  Uses frequency selection
  S  Input                     Last Selection Point        QL  Pri  Status
  == ======================    ======================     ====== ==== ===========
     Ethernet1/9               n/a                         PRC   99  Unmonitored
     Ethernet1/13              n/a                         PRC  100  Unmonitored
  21 Internal0[1]             n/a                          SEC  255  Freerun    ≪
```

show frequency synchronization selection (without PTP Profile 8275-1)

The output of this command displays the detailed view of the different selection points within the system.

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Note   This example shows the output when PTP profile 8275-1 is <u>not</u> configured.

The following is an example of the output of the **show frequency synchronization selection** *slot* / *port* command:

```
switch# show frequency synchronization selection==============
Selection point: System Clock (T0) Selector (3 inputs, 1 selected)
  Last programmed 00:03:04 ago, and selection made 00:02:54 ago
  Next selection points
    Node scoped   :
  Uses frequency selection
  Used for local line interface output
  S  Input                     Last Selection Point        QL  Pri  Status
  == ======================    ======================     ====== ==== ===========
  11 Ethernet1/9               n/a                         PRC   99  Locked
     Ethernet1/13              n/a                         PRC  100  Available
     Internal0[1]              n/a                         SEC  255  Available
==============
Selection point: IEEE 1588 Clock Selector (3 inputs, 1 selected)
  Last programmed 00:03:04 ago, and selection made 3.296s ago
  Next selection points
    Node scoped   :
  Uses frequency selection
  S  Input                     Last Selection Point        QL  Pri  Status
  == ======================    ======================     ====== ==== ===========
     Ethernet1/9               n/a                         PRC   99  Unmonitored
     Ethernet1/13              n/a                         PRC  100  Unmonitored
  21 Internal0[1]             n/a                          SEC  255  Holdover   ≪
```

show esmc counters all

The output of this command displays counters for sent and received ESMC SSMs.

The following is an example of the output of the **show esmc counters all** command:

```
ESMC Packet Counters of Interface Ethernet1/1:
    ESMC SSMs        Total  Information     Event    DNU/DUS
       Sent:             0           0         0          0
       Received:         0           0         0          0

ESMC Packet Counters of Interface Ethernet1/5:
    ESMC SSMs        Total  Information     Event    DNU/DUS
       Sent:             0           0         0          0
       Received:         0           0         0          0

ESMC Packet Counters of Interface Ethernet1/9:
    ESMC SSMs        Total  Information     Event    DNU/DUS
       Sent:          7685        7683         2          0
       Received:      7688        7682         6         19

---------------------------------------------------------------
```

show esmc counters interface ethernet

The output of this command displays counters for sent and received ESMC SSMs on a specific interface.

The following is an example of the output of the **show esmc counters interface ethernet** *slot* / *port* command:

```
ESMC Packet Counters of Interface Ethernet1/9:
    ESMC SSMs        Total  Information     Event    DNU/DUS
       Sent:          7955        7953         2          0
       Received:      7958        7952         6         19

---------------------------------------------------------------
```

Verifying the PTP Telecom Profile Configuration

After performing the PTP telecom profile configuration tasks, use this reference to verify the configuration.

show running-config ptp all

The output of this command displays global and interface configurations for PTP telecom profile.

The following is an example of the output of the **show running-config ptp all** command:

```
switch# show running-config ptp all
!Command: show running-config ptp all
!Running configuration last done at: Fri Feb 21 20:09:55 2020
!Time: Fri Feb 21 21:10:19 2020

version 9.3(5) Bios:version 01.00
feature ptp

ptp profile 8275-1
  mode hybrid
ptp source 0.0.0.0
ptp device-type boundary-clock
ptp priority1 128
ptp priority2 10
ptp pdelay-req-interval 0
no ptp notification type parent-change
no ptp notification type gm-change
no ptp notification type high-correction
no ptp notification type port-state-change
ptp correction-range 100000
no ptp correction-range logging
ptp management
ptp mean-path-delay 1000000000
```

```
ptp domain 24
ttag-marker-interval 60


interface Ethernet1/1
  ptp
  no ptp profile-override
  ptp destination-mac non-forwardable rx-no-match accept
  ptp transport ethernet
  ptp transmission multicast
  ptp role dynamic
  ptp cost 128
  ptp delay-request minimum interval -4
  ptp announce interval -3
  ptp sync interval -4
  ptp announce timeout 3

interface Ethernet1/6
  ptp
  no ptp profile-override
  ptp destination-mac non-forwardable rx-no-match accept
  ptp transport ethernet
  ptp transmission multicast
  ptp role dynamic
  ptp cost 128
  ptp delay-request minimum interval -4
  ptp announce interval -3
  ptp sync interval -4
  ptp announce timeout 3

interface Ethernet1/7
  ptp
  no ptp profile-override
  ptp destination-mac non-forwardable rx-no-match accept
  ptp transport ethernet
  ptp transmission multicast
  ptp role dynamic
  ptp cost 128
  ptp delay-request minimum interval -4
  ptp announce interval -3
  ptp sync interval -4
  ptp announce timeout 3

interface Ethernet1/8
  ptp
  no ptp profile-override
  ptp destination-mac non-forwardable rx-no-match accept
  ptp transport ethernet
  ptp transmission multicast
  ptp role dynamic
  ptp cost 128
  ptp delay-request minimum interval -4
  ptp announce interval -3
  ptp sync interval -4
  ptp announce timeout 3
```

Note The output of the **show running-config ptp all** command displays a complete list of all the PTP configured interfaces.

show ptp parent

The output of this command displays the properties of a PTP parent.

The following is an example of the output of the **show ptp parent** command:

```
switch# show ptp parent
PTP PARENT PROPERTIES

Parent Clock:
Parent Clock Identity: 10:b3:d6:ff:fe:bf:a8:63
Parent Port Number: 0
Observed Parent Offset (log variance): N/A
Observed Parent Clock Phase Change Rate: N/A

Grandmaster Clock:
Grandmaster Clock Identity: 10:b3:d6:ff:fe:bf:a8:63
Grandmaster Clock Quality:
        Class: 248
        Accuracy: 254
        Offset (log variance): 65535
        Priority1: 128
        Priority2: 10
```

show ptp corrections

The output of this command displays up to the last 2000 correction details for each PTP slave port.

The following is an example of the output of the **show ptp corrections** command:

```
switch# show ptp corrections
PTP past corrections
-----------------------------------------------------------------------------
Slave Port         SUP Time                Correction(ns)    MeanPath Delay(ns)
----------    ------------------------------  ----------------  ------------------
Eth1/3       Thu Feb 20 22:51:02 2020 861523        4              260
Eth1/3       Thu Feb 20 22:51:02 2020 735961        4              260
Eth1/3       Thu Feb 20 22:51:02 2020 610170        4              268
Eth1/3       Thu Feb 20 22:51:02 2020 483106        0              280
Eth1/3       Thu Feb 20 22:51:02 2020 355745        0              280
Eth1/3       Thu Feb 20 22:51:02 2020 229924       -4              268
Eth1/3       Thu Feb 20 22:51:02 2020 104819       -4              268
Eth1/3       Thu Feb 20 22:51:01 2020 979604        8              272
```

show ptp clock

The output of this command displays the properties of the local clock, including clock identity.

The following is an example of the output of the **show ptp clock** command:

```
switch# show ptp clock
PTP Device Type : boundary-clock
PTP Device Encapsulation : NA
PTP Source IP Address : 0.0.0.0
Clock Identity : 10:b3:d6:ff:fe:bf:a8:63
Clock Domain: 24
Slave Clock Operation : Unknown
Master Clock Operation : Two-step
Slave-Only Clock Mode : Disabled
Number of PTP ports: 35
Priority1 : 128
Priority2 : 10
Clock Quality:
        Class : 248
```

```
         Accuracy : 254
         Offset (log variance) : 65535
Offset From Master : 0
Mean Path Delay : 0
Steps removed : 0
Correction range : 100000
MPD range : 1000000000
Local clock time : Wed Feb 26 17:08:34 2020
Hardware frequency correction : NA
PTP Clock state                : Free-Run
```

show ptp brief

The output of this command displays the PTP clock state for each configred port.

The following is an example of the output of the **show ptp brief** command:

```
switch# show ptp brief
PTP port status
-----------------------------------
Port                 State
-------------------- ------------
Eth1/1               Slave
Eth1/6               Disabled
Eth1/7               Disabled
Eth1/8               Disabled
Eth1/10              Master
Eth1/11              Disabled
Eth1/12              Disabled
Eth1/13              Master
Eth1/14              Disabled
Eth1/15              Disabled
Eth1/16              Disabled
Eth1/17              Disabled
Eth1/18              Disabled
Eth1/19              Disabled
Eth1/20              Disabled
Eth1/21              Disabled
Eth1/22              Disabled
Eth1/23              Disabled
Eth1/24              Disabled
Eth1/25              Disabled
Eth1/26              Disabled
Eth1/27              Disabled
Eth1/28              Disabled
Eth1/29              Disabled
Eth1/30              Disabled
Eth1/31              Disabled
Eth1/32              Disabled
Eth1/33              Disabled
Eth1/34              Disabled
Eth1/35              Disabled
Eth1/36              Disabled
Eth1/37              Disabled
Eth1/38              Disabled
Eth1/39              Disabled
Eth1/40              Disabled
```

show ptp clock foreign-masters record

The output of this command displays the state of foreign masters known to the PTP process. For each foreign master, the output displays the clock identity, basic clock properties, and whether the clock is being used as a grandmaster..

The following is an example of the output of the **show ptp clock foreign-master-record** command:

```
switch# show ptp port status
P1=Priority1, P2=Priority2, C=Class, A=Accuracy,
OSLV=Offset-Scaled-Log-Variance, SR=Steps-Removed
GM=Is grandmaster

---------   ----------------------- ---  ----  ----  ---  -----  --------
Interface       Clock-ID          P1   P2    C     A    OSLV   SR
---------   ----------------------- ---  ----  ----  ---  -----  --------

Eth1/1    00:00:00:00:00:00:00:01   128  128   6    33   65535  0    GM
```