ENT-AN1039 Application Note
IEEE1588 and NTP Software Configuration Guide

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1 Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

1.1 Release 1.1

The following is a summary of the changes in revision 1.1 of this document.

- Profile configuration examples have been added. For more information, see Configuration with Profile, page 2.
- Configuration examples without profile have been added. For more information, see Configuration Without Profile, page 12.

1.2 Release 1.0

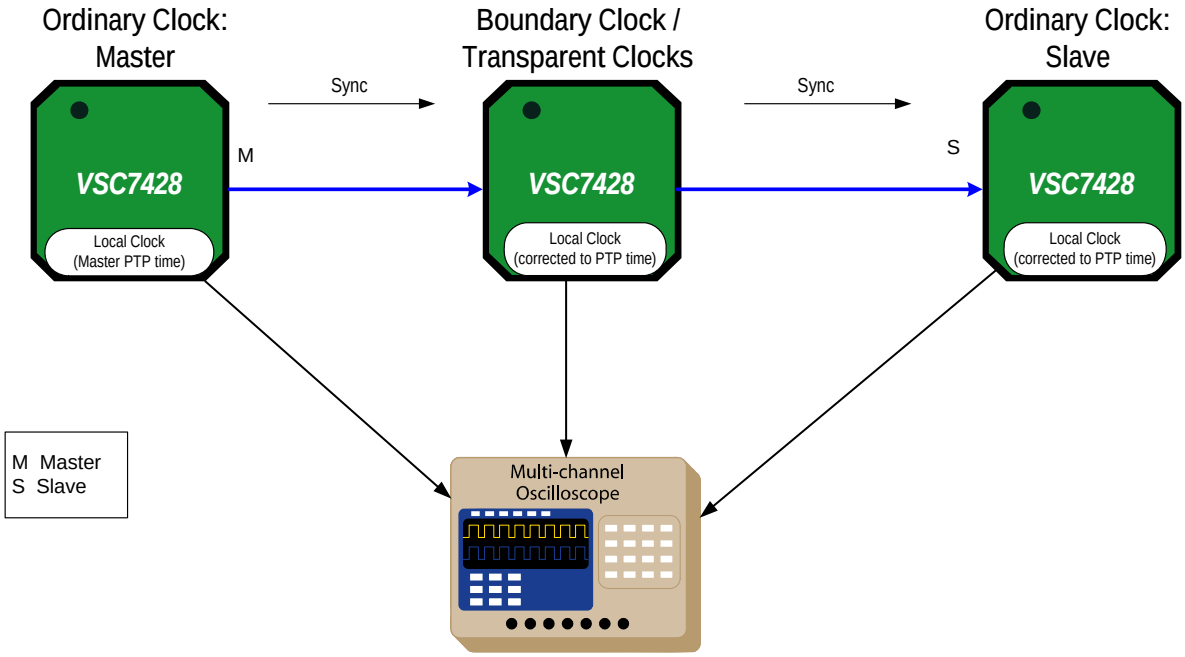
Revision 1.0 was the first publication of this document.

2 IEEE1588 and NTP Configuration

This document describes how to configure the IEEE1588v2 Precision Time Protocol (PTP) in CEServices™ applications running on Microsemi Carrier Ethernet switches. The Network Time Protocol (NTP) configuration is also described, including how to combine NTP and IEEE1588v2. Web-based configuration as well as the equivalent CLI commands are used in this document, based on the CEServices Software Development Kit (SDK) release 3.65.

The following illustration shows a simple network configuration based on three connected nodes. The physical connections between the nodes are 1 Gbps copper or optical (SFP).

Figure 1 • **Network Configuration**



2.1 Configuration with Profile

The CEServices IEEE1588 PTP implementation follows the IEEE1588-2008 (v2) standard. The standard allows other standardization bodies to create profiles and those use a specific set of parameters, optimizing the use of time synchronization for a specific purpose. The profiles are also allowed to add new additional features and replace the default Best Master Selection Algorithm (BMCA) with a profile-specific BMCA.

The CEServices release supports:

- Standard IEEE1588 profile
- ITU-T G.8265.1 Profile for frequency synchronization in a PTP-unaware network (from release 3.65)
- ITU-T G.8275.1 Profile for frequency and phase synchronization in a fully PTP-aware network (from release 3.66)
- No Profile

When creating a new PTP instance, it is possible to specify one of the above profiles, and all parameters are set according to the profile. If the profile requires the use of a BMCA other than the default BMCA, then this BMCA is used.

Note: It is possible to change parameters after a profile has been selected, but doing so might violate the profile. To return to the setting of the profile, click **Apply Default Profile** in the detailed configuration menu,

The following sections demonstrate G.8265.1 profile and G.8275.1 profile configurations.

2.1.1 Profile ITU-T G.8265.1

This profile uses the unicast Ipv4 protocol, therefore the slaves must be configured with the corresponding master(s). This profile is also designed for PTP-unaware networks, therefore the advanced MS-PDV filter algorithm is used.

In this example, the nodes use VLAN 1 for PTP communications. For the IP unicast profile G.8265.1, the nodes have IP addresses of 192.0.2.1-2/24.

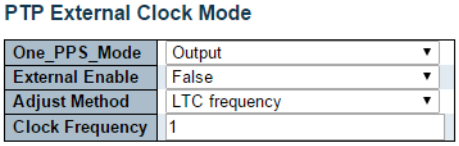
It is also assumed that the PTP master is frequency locked to a primary reference clock (PRC).

2.1.1.1 Configuring the Master using WebGUI

To configure a master, perform the following steps.

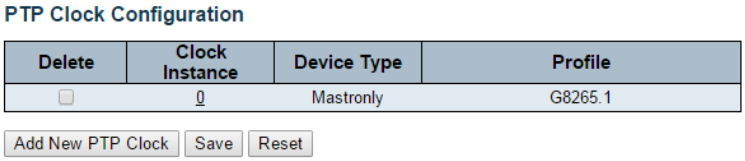
1. Go to **Configuration** > **PTP**, and configure as shown in the following illustration. This enables the one pps signal from the switch, used for synchronization between switch and PHY.

Figure 2 • **PTP External Clock Mode**



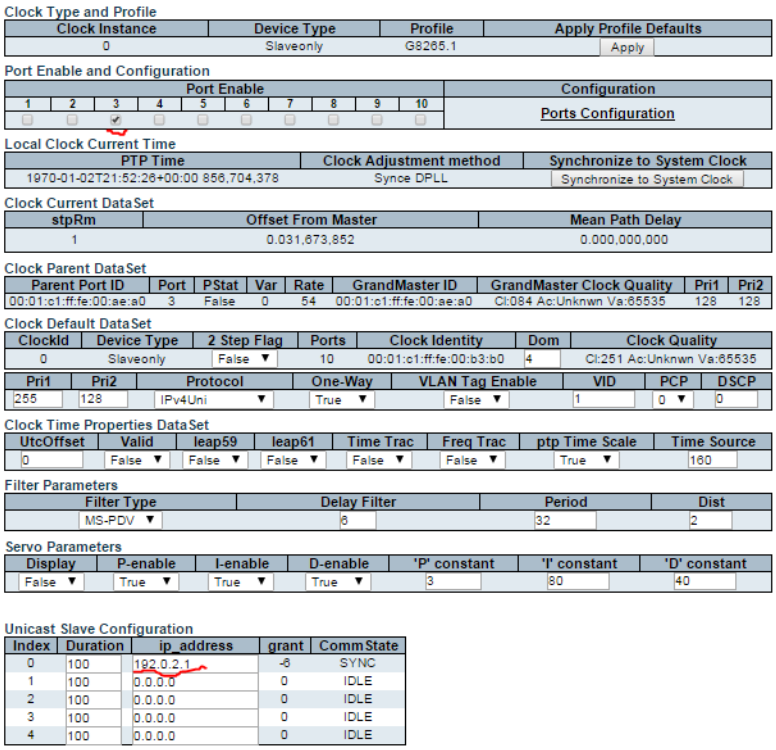
2. To create a PTP instance, click **Add New PTP Clock**.

Figure 3 • **PTP Clock Instance**



3. Enter the following parameters, and then click **Save**.
   - **Device type** - Mastronly
   - **Profile** - G8265.1
4. Click the Clock Instance to be configured and enter required configuration settings for **Select port(s)**.

Figure 4 • **PTP Clock's Configuration & Status**



5. Normally, the switch will be connected to GPS and receive timing information from the GPS. For testing purposes, it is possible to manually configure the Clock Quality of the PTP master.

```
#platform debug allow
#conf t
(config)# debug ptp 0 class 84
```

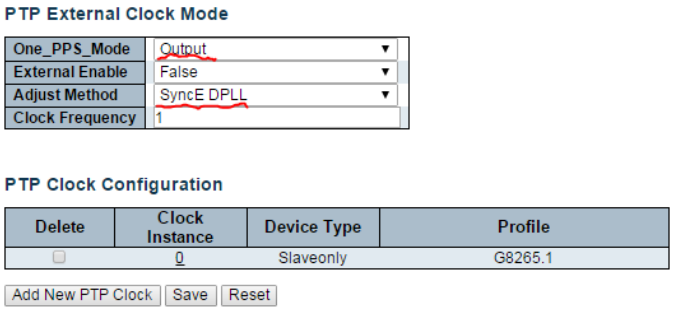
Note: For the Option 1 networks, the QL should be set to 84 (PRC) and for the Option 2 networks, the QL should be set to 80 (PRS).

2.1.1.2 Configuring the Slave using WebGUI

To configure a slave, perform the following steps.

1. Go to **Configuration** > **PTP**, and configure as shown in the following illustration. This enables the one pps signal from the switch, used for synchronization between switch and PHY.

Figure 5 • **PTP External Clock Mode**

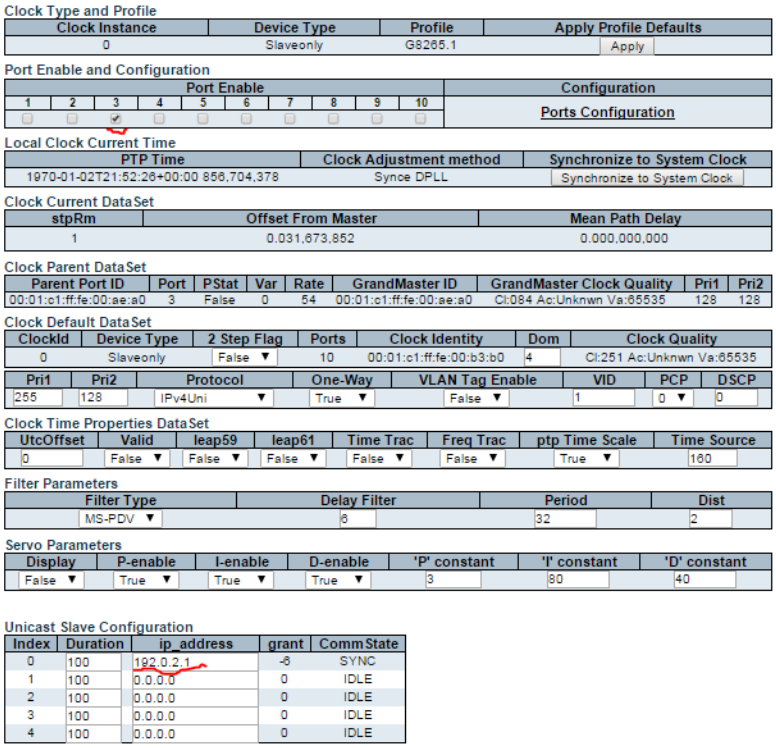


Note: Set the Adjustment Method to the default value of **SyncE DPLL**. This synchronizes the filter using the DPLL for adjustment and the output frequency with the PTP clock.

2. To create a PTP instance, click **Add New PTP Clock**.
3. Enter the following parameters, and then click **Save**.
   - **Device type** - Slaveonly
   - **Profile** - G8265.1

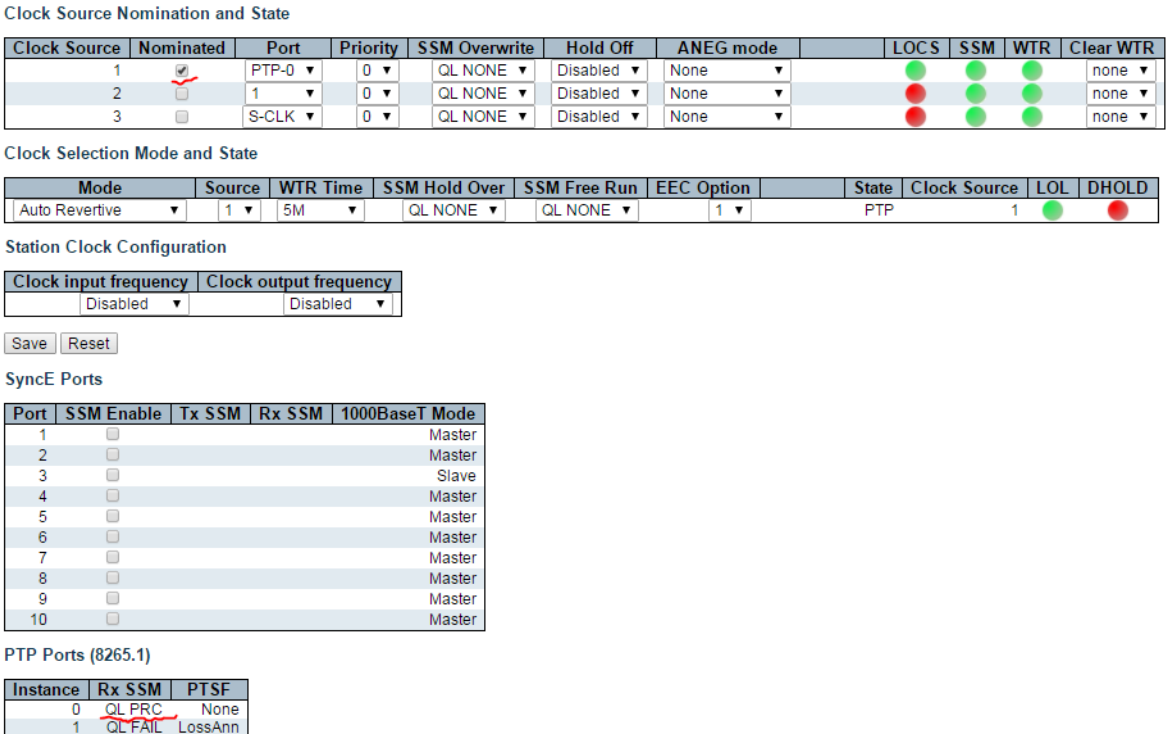
4. Click the Clock Instance to be configured and enter the following parameters.
   - **Port Enable - 3**
   - **Filter Type** - MS-PDV
   - **Unicast Slave Configuration** - 192.0.2.1

Figure 6 • **PTP Clock's Configuration & Status**



5. Click **Configuration** > **Sync**, and enter the following configuration details as shown in the following illustration.
   - **Nominated** - PTP-0 as clock source
   - **Rx SSM** - QL-PRC

Figure 7 • **Clock State Nomination**



2.1.1.3 Configuring Slave and Master using CLI

To configure a slave and a master, execute the following commands.

```
!Master
ptp 0 mode master onestep ip4uni oneway profile g8265.1 mep 1
ptp ext output ltc-frequency
interface GigabitEthernet 1/3
ptp 0

!Slave G.8265.1 Profile
network-clock clk-source 1 nominate ptp 0
ptp ms-pdv  min-phase 20 apr 1
ptp 0 mode slave onestep ip4uni oneway id 00:01:c1:ff:fe:00:b3:b0 vid 1 0
profile g8265.1 mep 1
ptp 0 priority1 255
ptp 0 filter delay 6 filter-type ms-pdv period 32 dist 2
ptp 0 uni 0 duration 100 192.0.2.1
ptp ext output synce-dpll
!
interface GigabitEthernet 1/3
 ptp 0
```

2.1.1.4 Verifying Configuration using WebGUI

To verify the master and slave configuration, perform the following steps. On the Slave check, it is locked to the master Clock.

1. Select **Monitor** > **PTP**, and click the PTP instance. Verify the following parameters.
   - **Slave State** = Locked. It can take an hour for the slave to lock when using the MS-PDV filter.
   - Offset from Master has arbitrary value but fixed value, as this profile is frequency sync only.
   - **Mean path Delay** = 0, as no delay measurements are done in this profile.
   - **Parent Port Identity** = ID of the node before.
   - **Grand Master Identity** = ID of Master node and Clock class is as set on the master.

- Unicast Slave Configuration, Grant, Comm State = -6, SYNC

Figure 8 • **Verify PTP Clock Configuration**

PTP Clock's Configuration

Local Clock Current Time

PTP Time	Clock Adjustment method	Ports Monitor Page
1970-01-02T22:10:52+00:00 438,921,594	Synce DPLL	Ports Monitor

Clock Default DataSet

ClockId	Device Type	2 Step Flag	Ports	Clock Identity	Dom	Clock Quality	Pri1	Pri2	Protocol	One-Way
0	Slaveonly	False	10	00:01:c1:ff:fe:00:b3:b0	4	Cl:251 Ac:Unknwn Va:65535	255	128	IPv4Uni	True

Clock Current DataSet

stpRm	Offset From Master	Mean Path Delay	Slave Port	Slave State	Holdover(ppb)
1	0.031,673,812	0.000,000,000	3	LOCKED	N.A.

Clock Parent DataSet

Parent Port Identity	Port	PStat	Var	ChangeRate	Grand Master Identity	Grand Master Clock Quality	Pri1	Pri2
00:01:c1:ff:fe:00:ae:a0	3	False	0	54	00:01:c1:ff:fe:00:ae:a0	Cl:084 Ac:Unknwn Va:65535	128	128

Clock Time Properties DataSet

UtcOffset	Valid	leap59	leap61	Time Trac	Freq Trac	ptp Time Scale	Time Source
0	False	False	False	False	False	True	160

Servo Parameters

Display	P-enable	I-enable	D-enable	'P' constant	'I' constant	'D' constant
False	True	True	True	3	80	40

Filter Parameters

Filter Type	DelayFilter	Period	Dist
MS-PDV	6	32	2

Unicast Slave Configuration

Index	Duration	IP_Address	Grant	Comm State
0	100	192.0.2.1	-6	SYNC
1	100	0.0.0.0	0	IDLE
2	100	0.0.0.0	0	IDLE
3	100	0.0.0.0	0	IDLE
4	100	0.0.0.0	0	IDLE

2. Click **Port Monitor** to verify the port states as shown in the illustration.

Figure 9 • **Verify PTP Clock's Port Data Set Configuration**

PTP Clock's Port Data Set Configuration

Port	Stat	MDR	PeerMeanPathDel	Anv	ATo	Syv	Dlm	MPR
3	slve	-6	0.000,000,000	1	2	-6	e2e	-6

2.1.1.5 Verifying Configuration using CLI

To verify the proper configuration for Port-Timer and Phy-timestamper for copper ports, execute the following CLI commands.

```
show ptp 0 port-state
Port  Enabled  PTP-State  Internal  Link  Port-Timer  Vlan-forw  Phy-timestamper
Peer-delay
----  -------  ---------  --------  ----  ----------  ---------  ---------------
---  ----------
   1  FALSE    dsbl       FALSE     Down  In Sync     Discard    FALSE            OK
   2  FALSE    dsbl       FALSE     Down  In Sync     Discard    FALSE            OK
   3  TRUE     slve       FALSE     Up    In Sync     Forward    TRUE             OK
```

Note: If 1588 PHY is used, then Phy-timestamper = True, and Port-Timer = In-sync

2.1.1.6 Troubleshooting

Ensure that the PTP-State on the ports are as expected.

If the port-timer shows out-of-sync, then the PHY is not synchronized to the switch. The cause for this might be that the One_pps_mode is NOT set to Output.

If Vlan-forw shows Discard, then VLAN configured for PTP does not match VLAN port setting.

2.1.2 Profile ITU-T G.8275.1

This profile uses the Ethernet protocol. This profile is designed for PTP-aware networks, therefore the Basic filter algorithm is used.

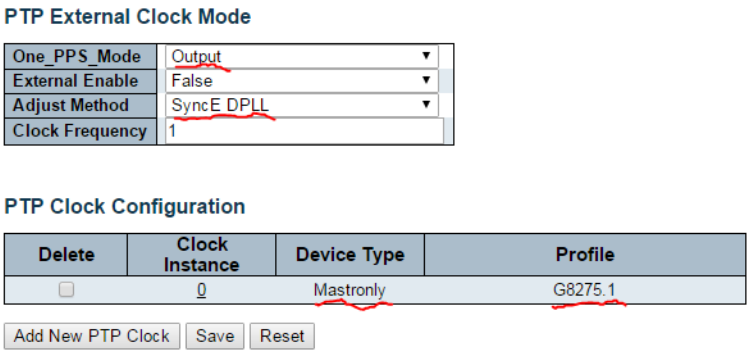
In the following example, the Adjust Method is set to the LTC Phase so that the SyncE controls the frequency, and PTP controls the phase.

2.1.2.1 Configuring the Master using WebGUI

To configure a master, perform the following steps.

1. Go to **Configuration** > **PTP**, and configure as shown in the following illustration. This enables the one pps signal from the switch, used for synchronization between switch and PHY.

Figure 10 • **PTP External Clock Mode**



2. To create a PTP instance, click **Add New PTP Clock**.
3. Enter the following parameters, and then click **Save**.
   - **Device type** - Mastronly
   - **Profile** - G8275.1
4. Click the Clock Instance to be configured and enter required configuration settings for **Select port(s)**.
5. Normally, the switch will be connected to GPS and receive timing information from the GPS. For testing purposes, it is possible to manually configure the Clock Quality of the PTP master.

```
#platform debug allow
#conf t
(config)# debug ptp 0 class 84
```

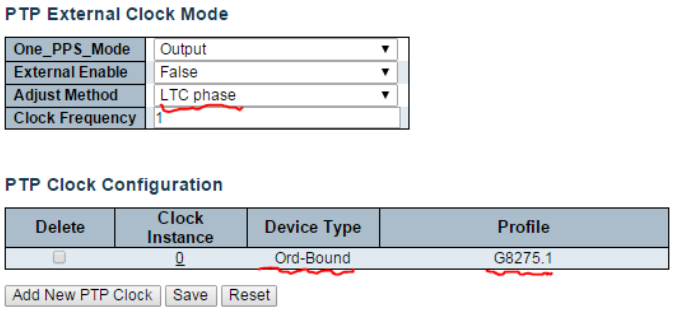
Note: For the Option 1 networks, the QL should be set to 84 (PRC) and for the Option 2 networks, the QL should be set to 80 (PRS).

2.1.2.2 Configuring the Boundary Clock using WebGUI

To configure the boundary clock, perform the following steps.

1. Go to **Configuration** > **PTP**, and configure as shown in the following illustration. This enables the one pps signal from the switch, used for synchronization between switch and PHY.

Figure 11 • **PTP External Clock Mode**



2. To create a PTP instance, click **Add New PTP Clock**.
3. Enter the following parameters, and then click **Save**.
   - **Device type** - Ord-Bound
   - **Profile** - G8275.1
4. Click the Clock Instance to be configured and enter required configuration settings for **Select port(s)**.

2.1.2.3 Configuring the Slave using WebGUI

To configure the slave, perform the following steps.

1. Go to **Configuration** > **PTP**, and configure the slave. This enables the one pps signal from the switch, used for synchronization between switch and PHY.
2. To create a PTP instance, click **Add New PTP Clock**.
3. Enter the following parameters, and then click **Save**.
   - **Device type** - Slaveonly
   - **Profile** - G8265.1
4. Click the Clock Instance to be configured and enter required configuration settings for **Select port(s)**.

2.1.2.4 SyncE Configuration

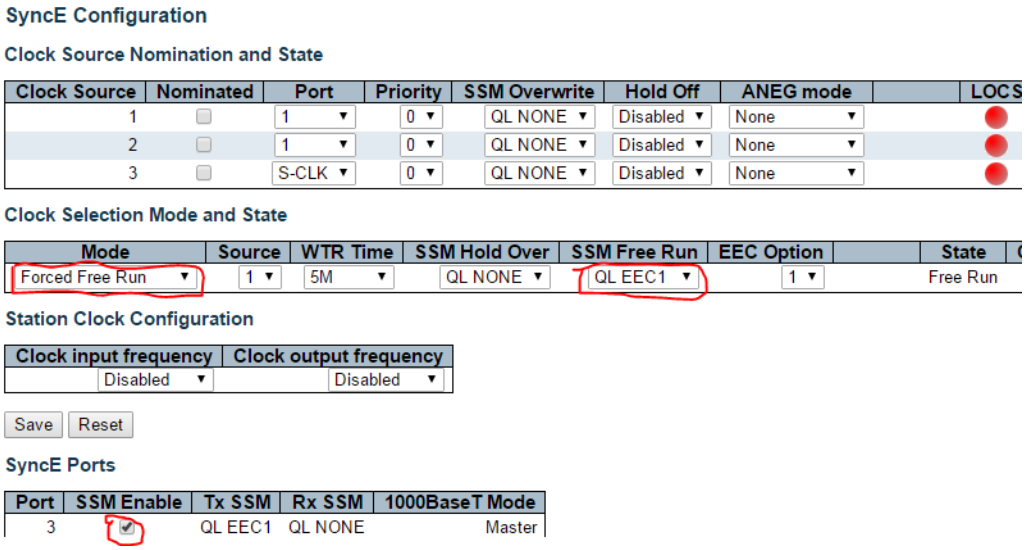
ITU-T.8275.1 also uses SyncE as a frequency source.

2.1.2.4.1 Configuring the Master for SyncE using WebGUI

Normally, the master receives a frequency input. For test purposes, this node works as the Grandmaster. To configure the master

- Go to the **SyncE Configuration** page, and configure as shown in the following illustration.

Figure 12 • **SyncE Configuration**

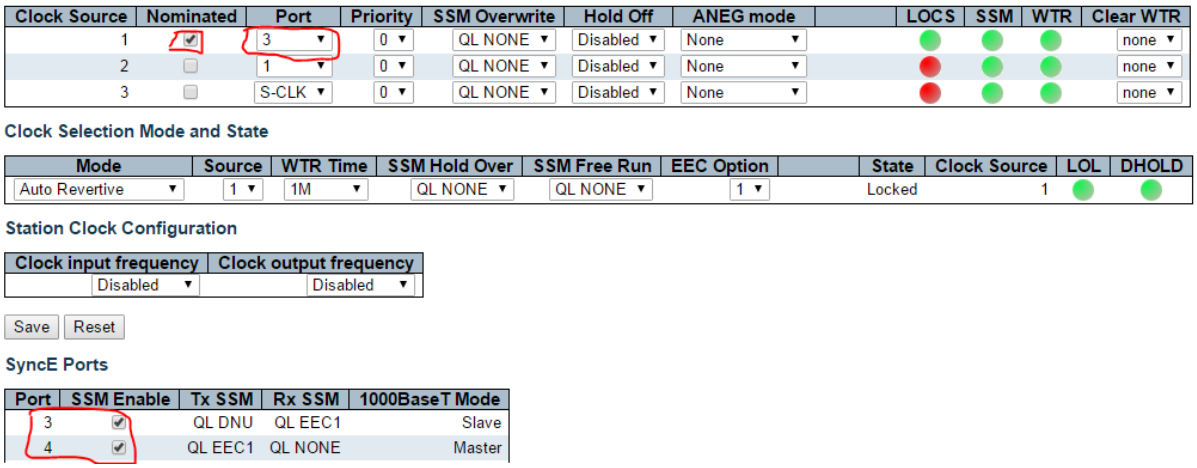


2.1.2.4.2 Configuring the Boundary Clock for SyncE using WebGUI

To configure the boundary clock

- Go to the **SyncE Configuration** page, and configure as shown in the following illustration.

Figure 13 • **SyncE Configuration**



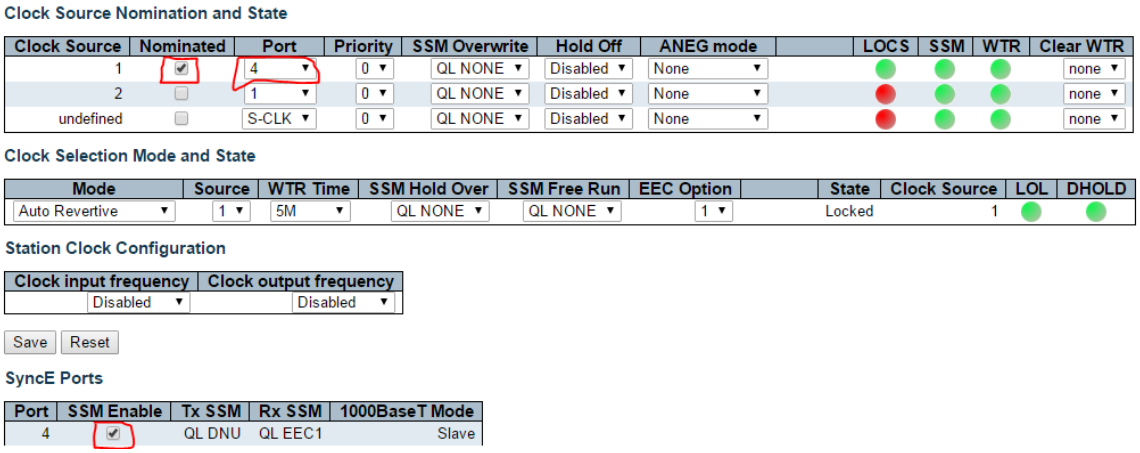
[

2.1.2.4.3 Configuring the Slave for SyncE using WebGUI

To configure the slave

- Go to the **SyncE Configuration** page, and configure as shown in the following illustration.

Figure 14 • **SyncE Configuration**



2.1.2.4.4 Configuring SyncE using CLI

To configure SyncE, execute the following commands.

```
!Master
network-clock ssm-freerun eec1
network-clock selector freerun
ptp 0 mode master onestep ethernet twoway vid 1 0 profile g8275.1
ptp 0 priority2 60
ptp ext output synce-dpll
interface GigabitEthernet 1/3
 switchport mode hybrid
 network-clock synchronization ssm
 ptp 0

!Boundary Clock
network-clock clk-source 1 nominate interface GigabitEthernet 1/3
ptp 0 mode boundary onestep ethernet twoway vid 1 0 profile g8275.1
ptp ext output ltc-phase
interface GigabitEthernet 1/3
```

```
 switchport mode hybrid
 network-clock synchronization ssm
 ptp 0
 !
interface GigabitEthernet 1/4
 switchport mode hybrid
 media-type rj45
 network-clock synchronization ssm
 ptp 0

! Slave
network-clock clk-source 1 nominate interface GigabitEthernet 1/4
ptp 0 mode slave onestep ethernet twoway vid 1 0 profile g8275.1
ptp ext output ltc-phase
interface GigabitEthernet 1/4
 switchport mode hybrid
 network-clock synchronization ssm
 ptp 0
```

2.1.2.4.5 Verifying Configuration using WebGUI

To verify the SyncE configuration setup, perform the following steps.

Note: On the Slave check, it is locked to the master Clock.

1. Select **Monitor** > **PTP**, and click the PTP instance. Verify the following parameters.
   - **Slave State** = Locked
   - **Offset From Master** = between -20 to +20
   - **Mean path Delay** = if directly connected, this is the cable transmission delay
   - **Parent Port Identity** = ID of the node before
   - **Grand Master Identity** = ID of Master node
   - **Change rate** = 0 (when synchronized using SyncE)

Figure 15 • **Verify SyncE Configuration**

Clock Type and Profile

Clock Instance	HW Domain	Device Type	Profile
0	0	Ord-Bound	G8275.1

Local Clock Current Time

PTP Time	Clock Adjustment method	Ports Monitor Page
1970-01-01T01:09:06+00:00 084,938,818	Internal Phase	Ports Monitor

Clock Default DataSet

Device Type	One-Way	2 Step Flag	Ports	Clock Identity	Dom	Clock Quality	Pri1	Pri2	Local Prio
Ord-Bound	False	False	6	00:3a:99:ff:fe:fd:49:84	24	Cl:248 Ac:Unknwn Va:65535	128	128	128

Clock Current DataSet

stpRm	Offset From Master	Mean Path Delay	Slave Port	Slave State	Holdover(ppb)
1	0.000,000,000	0.000,000,005	3	LOCKED	0.0

Clock Parent DataSet

Parent Port Identity	Port	PStat	Var	ChangeRate	Grand Master Identity	Grand Master Clock Quality	Pri1	Pri2
00:01:c1:ff:fe:00:c5:b0	3	False	0	0	00:01:c1:ff:fe:00:c5:b0	Cl:248 Ac:Unknwn Va:65535	128	60

2. Click **Port Monitor** to verify the port states are as shown in the illustration.

Figure 16 • **Verify PTP Clock's Port Data Set Configuration**

PTP Clock's Port Data Set Configuration

Port	Stat	MDR	PeerMeanPathDel	Anv	ATo	Syv	Dlm	MPR
3	slve	-4	0.000,000,000	-3	3	-4	e2e	-4
4	mstr	-4	0.000,000,000	-3	3	-4	e2e	-4

2.1.2.5 Verifying Configuration using CLI

To verify the proper configuration for Port-Timer and Phy-timestamper for copper ports, execute the following CLI commands.

```
show ptp 0 port-state
Port Enabled PTP-State Internal Link Port-Timer Vlan-forw Phy-timestamper
Peer-delay
---- ------- --------- -------- ---- ---------- --------- ------------
---  ----------
   1  FALSE    dsbl      FALSE    Down  In Sync    Discard   FALSE          OK
   2  FALSE    dsbl      FALSE    Down  In Sync    Discard   FALSE          OK
   3  TRUE     slve      FALSE    Up    In Sync    Forward   TRUE           OK
```

Note: If 1588 PHY is used, then Phy-timestamper = True and Port-Timer = In-sync

2.1.2.6 Troubleshooting

Ensure that the PTP-State on the ports are as expected.

If the port-timer shows out-of-sync, then the PHY is not synchronized to the switch. The cause for this could be that the One_pps_mode is NOT set to Output.

If Vlan-forw shows Discard, then the VLAN configured for PTP does not match the VLAN port setting.

2.1.2.7 Other Parameters for G.8275.1 Profile

The following commands set the other parameters defined in the G.8275.1 standard.

```
(config)# ptp ho-spec cat1 <0-x> cat2 <0-x> cat3 <0-x>
(config)# ptp 0 localpriority <1-255>
(config-if)# ptp 0 localpriority <1-255>
(config-if)# ptp 0 mcast-dest  <default | link-local>
(config-if)# ptp 0 not_slave
```

Where,

- **ho-spec** - Holdover specification for G8275 PTP clocks
- **localpriority** - Local priority for G8275.1 BMC algorithm (1 is highest priority)
- **localpriority** - Local priority pr port for G8275.1 BMC algorithm (1 is highest priority)
- **mcast-dest** - Multicast destination address type for the port
- **not-slave** - “Not-slave' attribute for G8275.1 BMC algorithm

Note: Priority1 is not used in G.8275.1. Instead, the local priority is used. The priority order is Priority2 and then Local priority.

2.2 Configuration Without Profile

For applications other than 1588, G.8265.1 and G.8275.1, use No Profile and select the parameters to match the application.

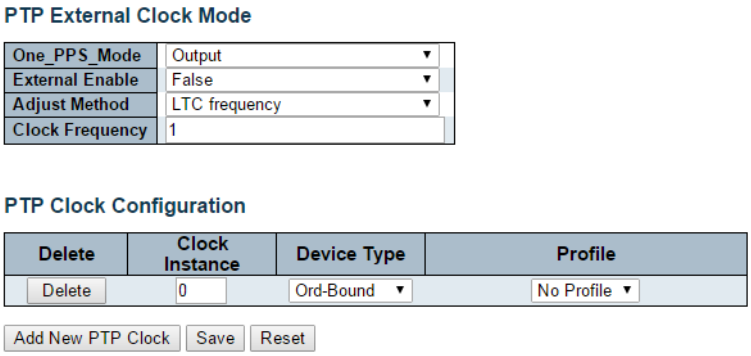
2.2.1 Configuring Master through E2E-Transparent Clock to Slave on Layer 2 (No Profile)

2.2.1.1 Configuring the Master using WebGUI

To configure a master, perform the following steps.

1. Go to **Configuration** > **PTP**, and configure as shown in the following illustration. This enables the one pps signal from the switch, used for synchronization between switch and PHY.

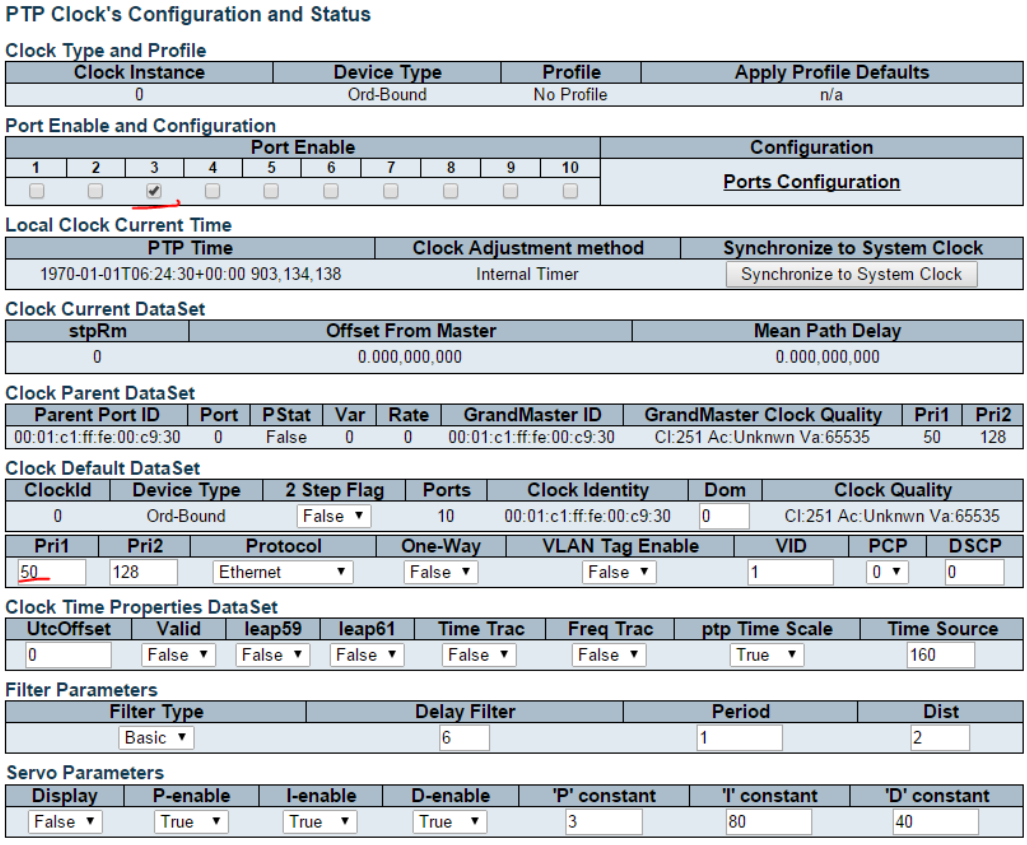
Figure 17 • **PTP External Clock Mode**



2. To create a PTP instance, click **Add New PTP Clock**.
3. Enter the following parameters, and then click **Save**.
   - **Device type** - Ord-Bound
   - **Profile** - No Profile
4. Click the **Clock Instance** to be configured, enter the following configuration details, and click **Save**.

- **Select port(s)**
- Lower the priority to make sure the switch becomes master

Figure 18 • **PTP Clock's Configuration & Status**

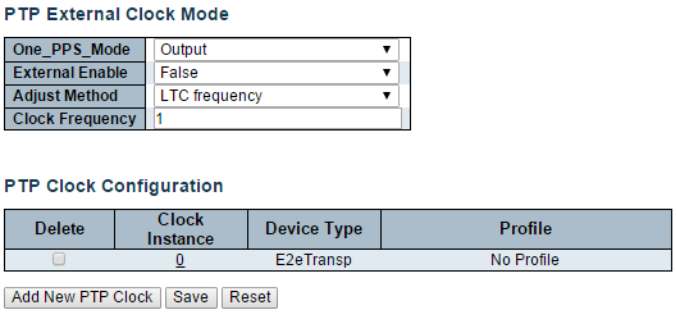


2.2.1.2 Configuring the Transparent Clock (TC) using WebGUI

To configure TC, perform the following steps.

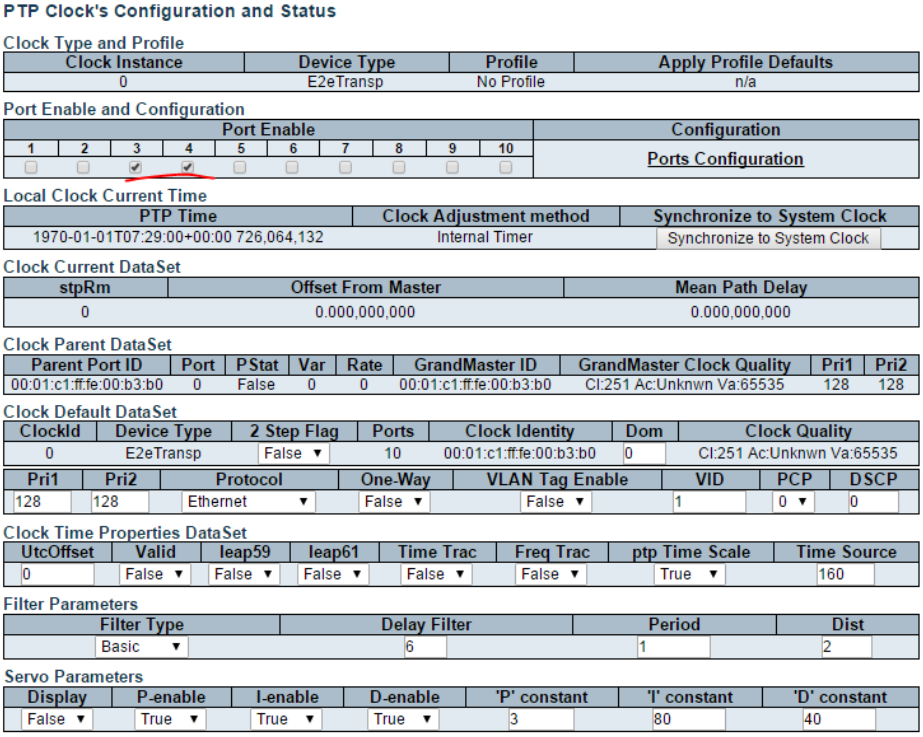
1. Go to **Configuration** > **PTP**, and configure as shown in the following illustration. This enables the one pps signal from the switch, used for synchronization between switch and PHY.
2. To create a PTP instance, click **Add New PTP Clock**.
3. Enter the following parameters, and then click **Save**.
   - **Device type** - e2eTransp
   - **Profile** - No Profile

Figure 19 • **PTP External Clock Mode**



4. Click the Clock Instance to be configured and enter the following configuration details for **Select port(s)**.

Figure 20 • **PTP Clock's Configuration & Status**



Note: Now, the TC node will forward all the PTP frames received on one port to the other and update the correction field in the PTP frames.

2.2.1.3 Configuring Slave using WebGUI

To configure a slave, perform the following steps.

1. Go to **Configuration** > **PTP**, and configure as shown in the following illustration. This enables the one pps signal from the switch, used for synchronization between switch and PHY.
2. To create a PTP instance, click **Add New PTP Clock**.
3. Enter the following parameters, and then click **Save**.
   - **Device type** - e2eTransp

- **Profile** - No Profile

4. Click the Clock Instance to be configured and enter the required configuration details for **Select port(s)**.

2.2.1.4 Configuring Master Through Transparent Clock to Slave on Layer 2 using CLI

To configure master through transparent clock to slave on layer 2, execute the following commands.

```
!Master
ptp 0 mode boundary onestep ethernet twoway vid 1 0 mep 1
ptp 0 priority1 50
ptp ext output ltc-freq
interface GigabitEthernet 1/3
 switchport mode hybrid
 ptp 0

!Transparent Clock
ptp 0 mode e2etransparent onestep ethernet twoway vid 1 0 mep 1
ptp ext output ltc-freq
interface GigabitEthernet 1/3
 switchport mode hybrid
 ptp 0
 !
interface GigabitEthernet 1/4
 switchport mode hybrid
 ptp 0

! Slave
ptp 0 mode boundary onestep ethernet twoway vid 1 0 mep 1
ptp ext output ltc-freq
interface GigabitEthernet 1/4
 switchport mode hybrid
 ptp 0
```

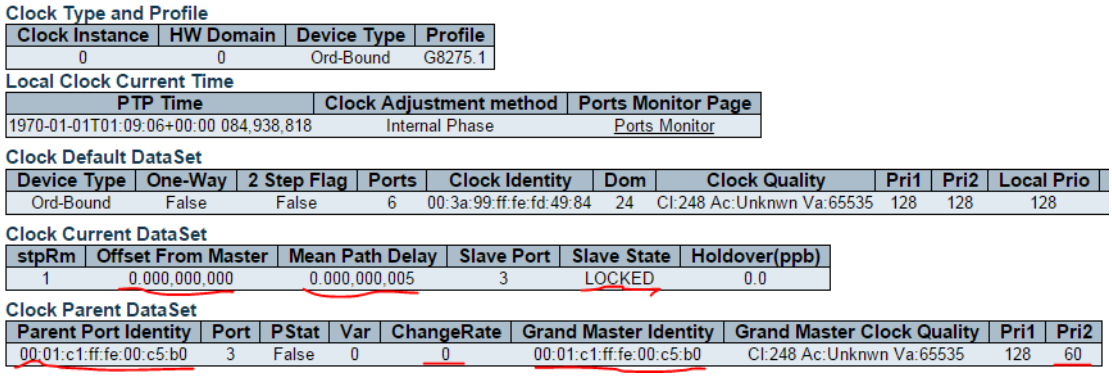
2.2.1.5 Verifying Configuration using WebGUI

To verify that the PTP protocol is running properly, perform the following steps.

Note: On the Slave check, it is locked to the master Clock.

1. Select **Monitor** > **PTP**, and click the PTP instance. Verify the following parameters.
   - **Slave State** = Locked
   - **Offset From Master** = between -20 to +20
   - **Mean path Delay** = if directly connected, this is the cable transmission delay
   - **Parent Port Identity** = ID of the node before
   - **Grand Master Identity** = ID of Master node
   - **Change rate** = 0 (when synchronized using SyncE)

Figure 21 • **Verify SyncE Configuration**



Clock Type and Profile

Clock Instance	HW Domain	Device Type	Profile
0	0	Ord-Bound	G8275.1

Local Clock Current Time

PTP Time	Clock Adjustment method	Ports Monitor Page
1970-01-01T01:09:06+00:00 084,938,818	Internal Phase	Ports Monitor

Clock Default DataSet

Device Type	One-Way	2 Step Flag	Ports	Clock Identity	Dom	Clock Quality	Pri1	Pri2	Local Prio
Ord-Bound	False	False	6	00:3a:99:ff:fe:fd:49:84	24	Cl:248 Ac:Unknwn Va:65535	128	128	128

Clock Current DataSet

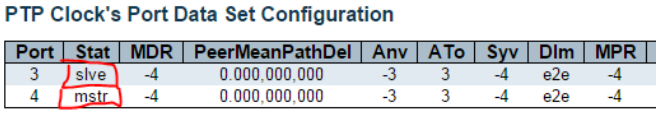
stpRm	Offset From Master	Mean Path Delay	Slave Port	Slave State	Holdover(ppb)
1	0.000,000,000	0.000,000,005	3	LOCKED	0.0

Clock Parent DataSet

Parent Port Identity	Port	PStat	Var	ChangeRate	Grand Master Identity	Grand Master Clock Quality	Pri1	Pri2
00:01:c1:ff:fe:00:c5:b0	3	False	0	0	00:01:c1:ff:fe:00:c5:b0	Cl:248 Ac:Unknwn Va:65535	128	60

2. Click **Port Monitor** to verify the port states as shown in the illustration.

Figure 22 • **Verify PTP Clock's Port Data Set Configuration**



PTP Clock's Port Data Set Configuration

Port	Stat	MDR	PeerMeanPathDel	Anv	ATo	Syv	Dlm	MPR
3	slve	-4	0.000,000,000	-3	3	-4	e2e	-4
4	mstr	-4	0.000,000,000	-3	3	-4	e2e	-4

Note: For Transparent clock, only the port-state is checked.

2.2.1.6 Verifying Configuration using CLI

To verify the proper configuration for Port-Timer and Phy-timestamper for copper ports, execute the following CLI commands.

```
show ptp 0 port-state
# sh ptp 0 port-st
Port Enabled PTP-State Internal Link Port-Timer Vlan-forw Phy-timestamper
Peer-delay
---- ------- --------- -------- ---- ---------- --------- ------------
---  ----------
  1  FALSE   dsbl      FALSE    Down  In Sync    Discard   FALSE          OK
  2  FALSE   dsbl      FALSE    Down  In Sync    Discard   FALSE          OK
  3  TRUE    e2et      FALSE    Up    In Sync    Forward   TRUE           OK
  4  TRUE    e2et      FALSE    Up    In Sync    Forward   TRUE           OK
```

2.2.1.7 Troubleshooting

Ensure that the PTP-State on the ports are as expected.

If the port-timer shows the PTP-State is out-of-sync, then the PHY is not synchronized to the switch. The reason for this could be that the One_pps_mode is not set to Output.

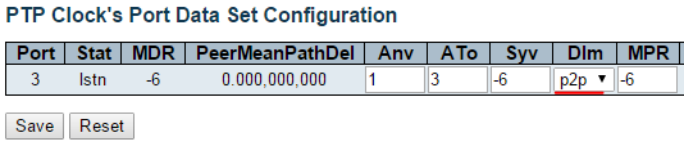
If Vlan-forw shows Discard, then VLAN configured for PTP does not match the VLAN port setting.

2.2.2 Configuring Master through P2P-Transparent Clock to Slave on Layer 2 (No Profile)

This configuration is very similar to the E2E configuration discussed in Configuring Master through E2E-Transparent Clock to Slave on Layer 2 (No Profile), page 12, with the following changes.

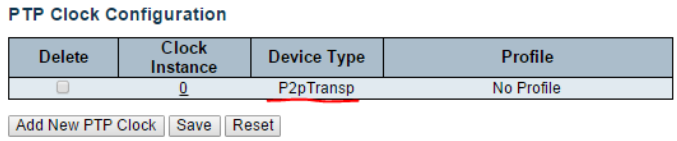
- Master and Slave nodes (Boundary Clock) - Set Dlm (Delay measurement) to p2p.

Figure 23 • **Port Data Set Configuration**



- Set Dlm (Delay measurement) to p2p - Create the PTP instance as P2pTransp.

Figure 24 • **PTP Clock Configuration**



2.2.3 Other Parameters

There are two types of PTP parameters:

- IEEE1588 standard parameters
- Filter parameters

The naming and value types follow the IEEE1588 standard, so consult the standard for further description.

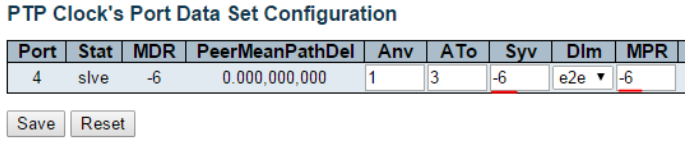
For description of filter parameters, click the web help on the application interface. The parameters can be adjusted through the PTP instance.

2.2.3.1 Managing Sync and Delay Request rates

The default sync rate is 1 f/s and the default delay-request rate is 1 f/8 s. Increasing these rates will improve accuracy. To adjust the rates

- Click the PTP instance and then for rates of 64 f/s, configure as shown in the following illustration.

Figure 25 • **Manage Parameters**

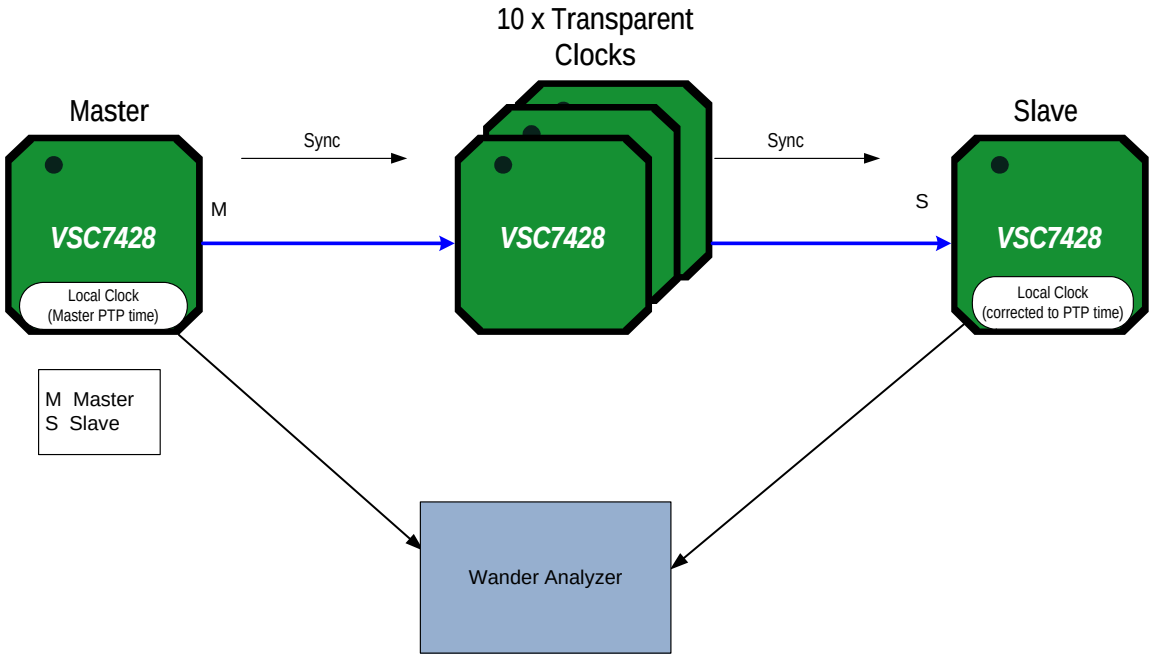


2.3 Measurement Results

IEEE1588 performance is measured as the time offset between the master and the slave node. One pps signal is generated by both the master and the slave nodes. Offset is measured by a Wander Analyzer with the result presented as a Maximum Time Interval Error (MTIE) curve.

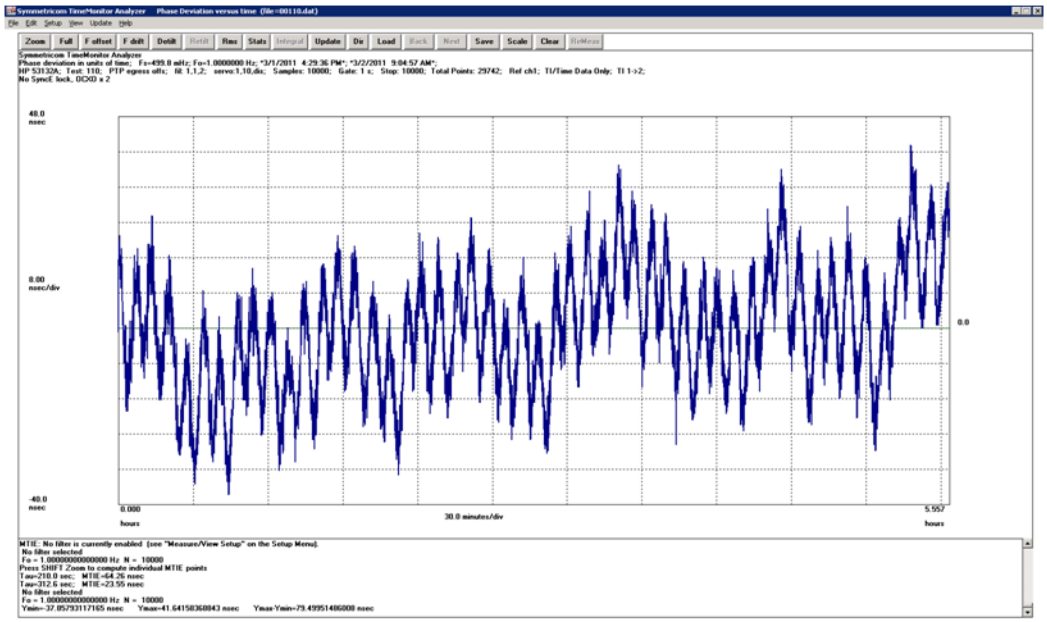
To illustrate a larger network, 10 transparent clock nodes are used.

Figure 26 • **Measurement Configuration**



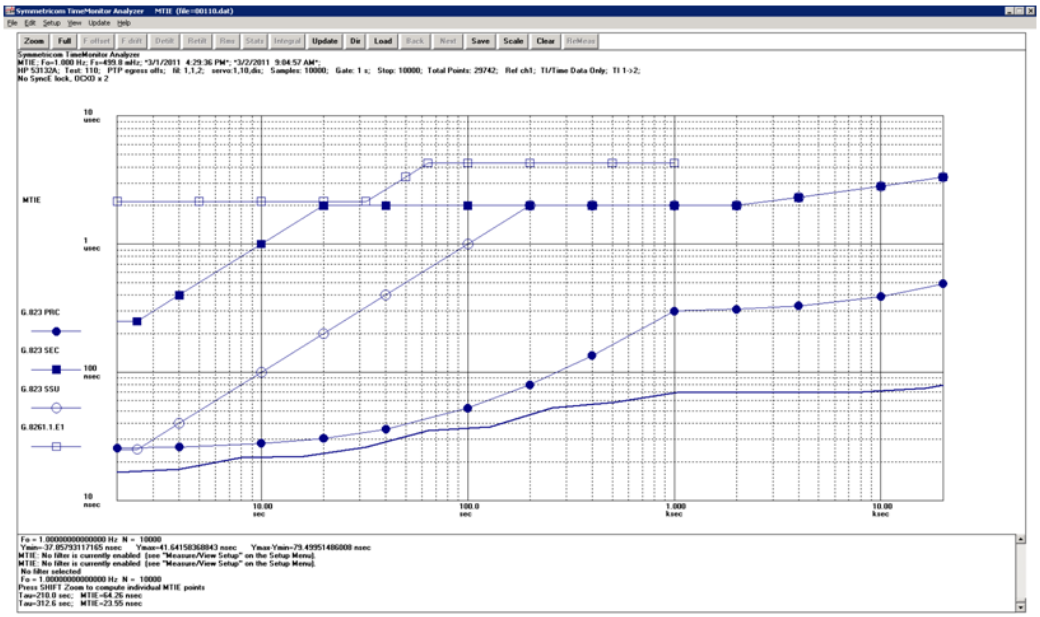
A simple filtering algorithm on the slave is used for fast lock time. The following illustration shows a representative offset chart.

Figure 27 • **Offset Between Master and Slave thru 10 Transparent Clocks**



A representative MTIE graph may also be obtained.

Figure 28 • **MTIE Between Master and Slave with 10 Transparent Clock Nodes**



The solid lowest line is the actual measurement, compared to different standard masks from G.8261.1 E1 down to G.823 PRC.

2.4 NTP and Time Zone Configuration

The Network Time Protocol (NTP) synchronizes the time of day among a set of distributed time servers and clients. This helps a user correlate events from system logs and other time-specific events from multiple network devices. NTP uses the User Datagram Protocol (UDP) as its transport protocol. All NTP communications use Coordinated Universal Time (UTC).

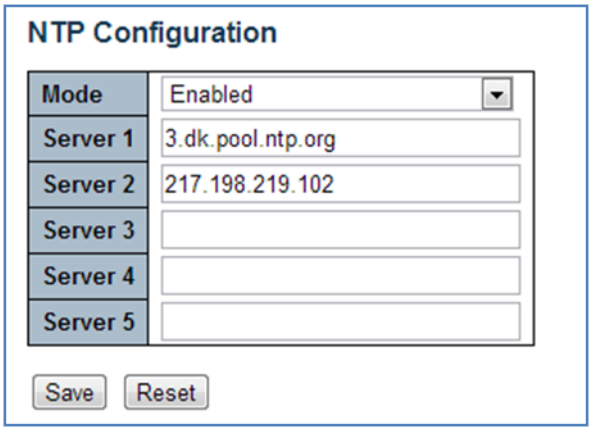
The CEServices software supports NTP client functionality. NTP version 4 is implemented, although it is disabled by default. The NTP IPv4 or IPv6 address can be configured and a maximum of five servers is supported.

2.4.1 Configuring NTP using WebGUI

To configure the NTP and server address

- Go to **Configuration** > **System** > **NTP**, and set the configuration details as shown in the following illustration.

Figure 29 • **NTP Configuration**



2.4.2 Configuring NTP using CLI

To configure the NTP and server address, execute the following CLI commands.

```
# configure terminal
! Enable Enable NTP and set server address
(config)# ntp
(config)# ntp server 1 ip-address 3.dk.pool.ntp.org
(config)# ntp server 1 ip-address 217.198.219.102
```

The CEServices software allows the user to configure the local time zone. The switch must be configured to acquire the time from an NTP server. The default time zone is configured as None.

An acronym may optionally be assigned to a selected time zone. The acronym can be up to 16 alpha-numeric characters in length, allowing special characters such as, '-' (hyphen), '.' (period), and '_' (underscore). The acronym is case sensitive.

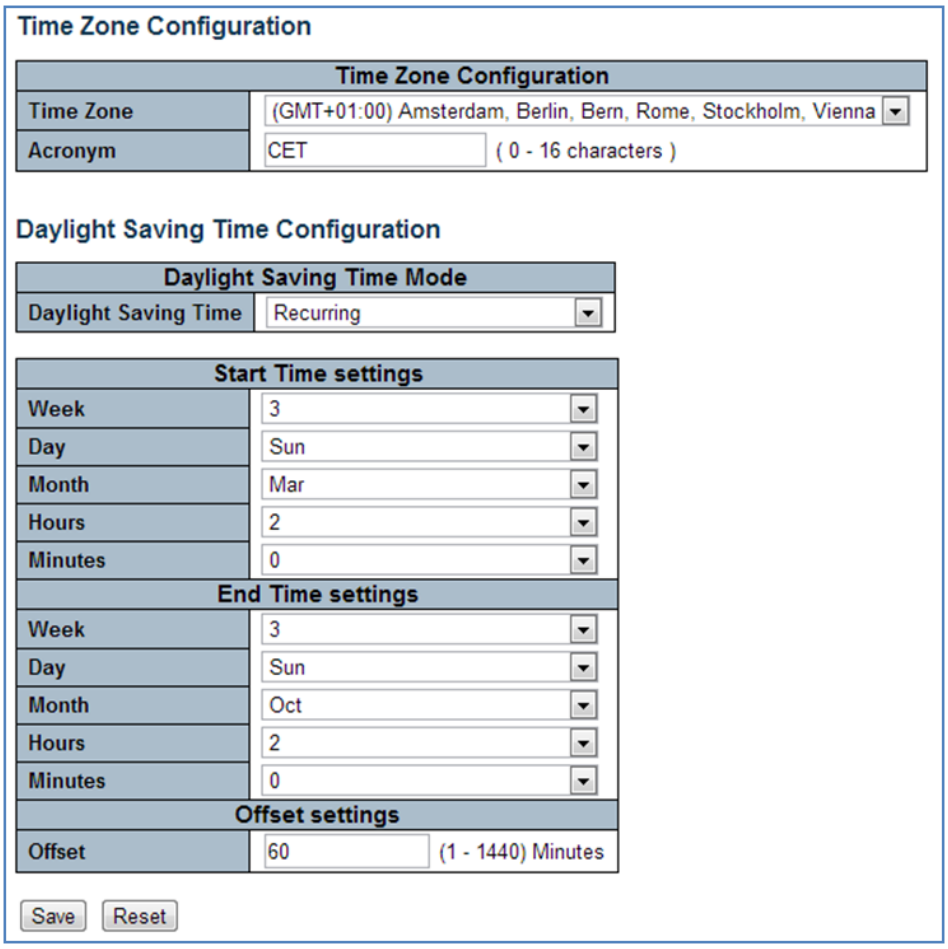
The CEServices software will allow the user to configure Daylight Savings Time (DST) if and when it occurs for a time zone. When configured, the system time will automatically adjust during Daylight Savings Time.

2.4.3 Configuring Time Zone using WebGUI

To configure the Time Zone

- Go to **Configuration** > **System** > **Time**, and set the configuration details as shown in the following illustration.

Figure 30 • **Time Zone Configuration**



2.4.4 Configuring Time Zone using CLI

To configure the Time Zone, execute the following CLI commands.

```
# configure terminal
! Set time zone and Daylight saving
(config)# clock summer-time CET recurring 3 7 3 02:00 3 7 10 02:00 60 (config)#
clock timezone CET 1
```

2.5 PTP and System Clock (NTP) Synchronization

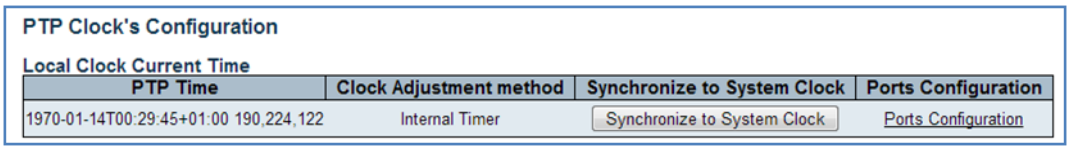
Normally, the PTP clock comes from an IEEE1588 Grand Master, but if a Grand Master is not available, it is possible to use the NTP time as a PTP clock.

2.5.1 Synchronizing PTP and System Clock (NTP) using WebGUI

To configure PTP and NTP

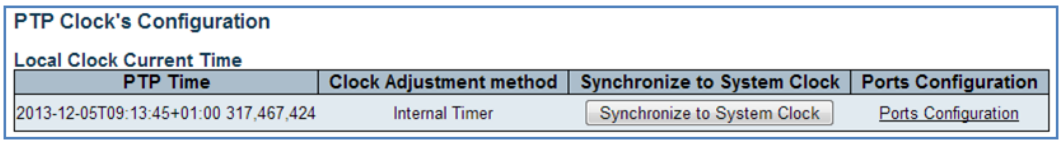
- Go to **Configuration** > **PTP** > **Clock**, and click **Synchronize to System Clock** to use the local system clock as the PTP clock.

Figure 31 • **PTP Clock Synchronization**



The page gets updated.

Figure 32 • **PTP Clock Update**



2.5.2 Synchronizing PTP and System Clock (NTP) using CLI

To configure PTP and NTP, execute the following CLI commands.

```
# configure terminal
! Synchronize PTP time to System Clock
# ptp 0 local-clock update
```

It is also possible to continuously (each second) synchronize the PTP time and System time. This is done using the following CLI commands.

```
# configure terminal
! Synchronize PTP time to System Clock
(config)# ptp system-time set
! Or Synchronize System Clock to PTP time
(config)# ptp system-time get
```