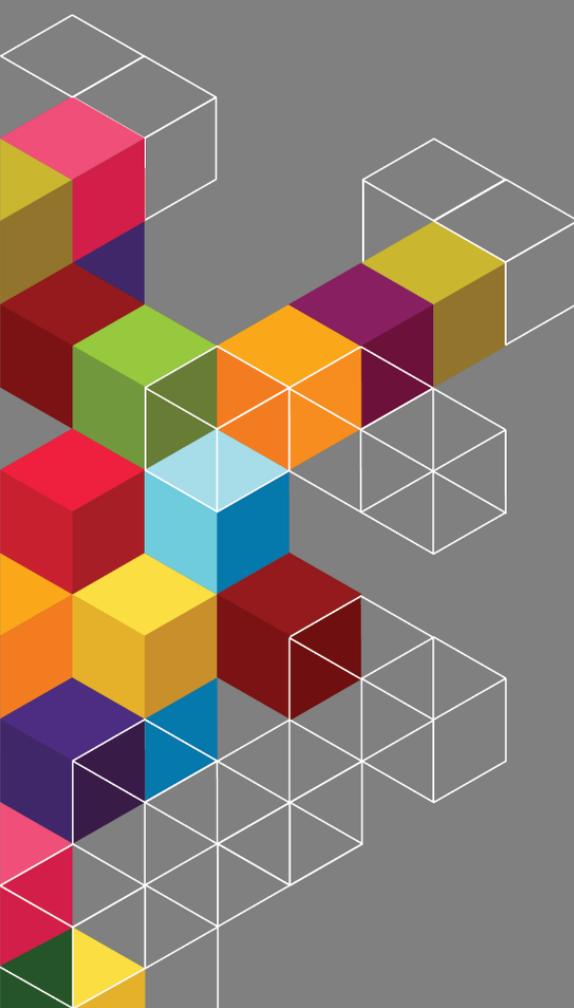


Calnex Paragon - *x*



Software Release 26x (X.10.39.xx) July 2018

NEW FUNCTIONALITY AND ENHANCEMENTS



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1 Software Release Overview

Release 26X (X.10.39) adds the following features to Paragon-X, and PFV¹

SUS (Software Upgrade Service)

New Option: Broadcast Profile Support (Option 283)	Enhancements to existing options	Base product enhancements
<p>Enhanced PTP test Capability for SMPTE ST 2059-2 Broadcast Profile:</p> <ul style="list-style-type: none"> • Drop-down profile configuration • Management message generation with control of SM-TLV 	<p>Advanced Time of Day (Option 230):</p> <ul style="list-style-type: none"> • ITU-T G.8271 ToD support <p>PTP Field Verifier (PFV):</p> <ul style="list-style-type: none"> • C37.238-2017 Pass/Fail analysis • SMPTE ST 2059-2 Pass/Fail analysis • Enhanced Inter-message gap/message rate testing <p>Calnex Analysis Tool (CAT):</p> <ul style="list-style-type: none"> • Positive/Negative 2way TE Transient Response mask <p>Peer-to-Peer Master Slave Emulation (Option 252):</p> <ul style="list-style-type: none"> • Timeplane adjustment for Industrial application testing 	<p>Defect Fixes</p>

 To check the current software version installed, select Help > About Paragon Remote Client on the Paragon-X GUI.

¹ This release includes enhancements to the PFV. The PFV option allows PTP protocol to be analysed to standards-based and user-defined profiles.

2 Features and Benefits

Paragon-X	Benefit
New Option: SMPTE Broadcast Profile Support (Option 283)	Perform complete Time Error testing on devices intended for use in Broadcast environments, including essential profile-specific fields included in SMPTE ST-2059-2
Advanced Time of Day (Option 230): ITU-T G.8271 ToD support	In parallel with PTP, SyncE and/or 1pps timing testing as required, provide stimulus and measurement of ITU-T format Time-of-Day messages as required for applications such as Assisted Partial Timing Support (ITU-T G.8273.4)
Peer-to-Peer Master Slave Emulation (Option 252): Timeplane adjustment for Industrial application testing	Utilise the full range of Paragon-X PTP time error test and measurement features while maintaining the minimal link delay essential for Industrial (and other) deployments
Peer-to-Peer Master Slave Emulation (Option 252): 2017 Power Profile support	Perform complete Time Error testing on devices intended for use in Power generation and distribution environments, using the latest version of the IEEE PTP Power Profile; C37.238-2017
PFV	Benefit
IEEE C37.238-2017 'Power Profile', SMPTE ST-2059-2 'Broadcast Profile'	Allows fast protocol analysis (and debug) for the Power profile and Broadcast Profile, for devices using these - or multiple - profile configurations
Enhanced Inter-message gap/message rate testing	Quickly confirm PTP message rates and transmitted logmessageinterval values match – prove PTP implementation is correct
CAT	Benefit
Positive/Negative 2way TE Transient Response mask	Standards-based Pass/Fail analysis for a range of device responses to the defined stimulus – reduce troubleshooting on 'corner-case' performance

3 New Options

3.1 SMPTE Broadcast Profile Support (Option 283)

The Society of Motion Picture and Television Engineers have defined the 2059-2 PTP profile to meet the needs of Professional Broadcast. Hence this is commonly referred to as the **PTP Broadcast Profile**.

Along with the requirement to configure equipment and networks appropriately to deliver synchronization accurate to 1 microsecond across a network, the Broadcast profile provisions for a **Synchronization Metadata (SM) TLV** – carried in PTP management messages - to carry timing-related information (such as default frame rates) through the ethernet network.

With the addition of the Broadcast profile option (283) to any existing PTP Master/Slave emulation option (270, 272, 250 or 252), the ability to configure SMPTE ST-2059-2 PTP quickly using the drop-down profile tool, plus generation of management messages with editable SM-TLV is added to the pre-existing PTP functionality.

The screenshot shows the 'Master + Slave Setup' interface. On the left, there is a sidebar with 'Master' and 'Slave' sections. The 'Master' section includes options like 'General Settings', 'VLAN Tags', 'Multicast/Unicast', 'Allowed Slaves', 'Common Header', 'Announce Message', 'TLVs', and 'Management' (which is selected). The 'Slave' section includes 'General Settings', 'VLAN Tags', 'Multicast/Unicast', 'Allowed Master', and 'Common Header'. Below the sidebar is the 'GPS Emulation' section with 'Time of Day'.

The main area shows a diagram of a 'Calnex Paragon-X' device with 'Master' and 'Slave' ports connected to a 'D.U.T.'. A dropdown menu on the right shows the selected profile: 'ST 2059-2:2015 SMPTE Profile'. Below the diagram, the 'Management' section is configured with:

- Type: ORG_EXT_SYNCHRONIZATION_METADATA
- Action: COMMAND
- Mode: Multicast
- Send: 1 Pkt/s

A table below shows the configuration for the ORG_EXT_SYNCH_METADATA TLV:

Field	Value
tlvType:	00 03
lengthField:	00 30
organizationId:	68 97 e8
organizationSubType:	00 00 01
defaultSystemFrameRate:	00 00 00 00 00 00 00 00
masterLockingStatus:	00
timeAddressFlags:	00
currentLocalOffset:	ff ff ff db
jumpSeconds:	00 00 00 00
timeOfNextJump:	00 00 00 00 00 00
timeOfNextJam:	00 00 00 00 00 00
timeOfPreviousJam:	00 00 00 00 00 00
previousJamLocalOffset:	00 00 00 00
daylightSaving:	00

4 Enhancements to Existing Options

4.1 ITU-T G.8271 ToD support (requires Option 230: Advanced Time of Day)

As stated in ITU-T G.8271, Time and phase synchronization interfaces are needed in networks/equipment for two purposes:

- As a measurement interface
- As a distribution interface

Particularly when used as a distribution interface, it is desirable for ToD messages to include information about synchronization status, for example to allow downstream equipment to select the best reference signal from the available options. Message formats to allow this are defined within G.8271.

This release adds the ability to generate and decode/verify/measure these ToD messages to the existing **Advanced Time of Day** option, allowing users to simulate stimulus conditions involving Phase/Time as a distribution interface, as well as verify output signal performance.

Note that generation and measurement of ToD messages uses the rear serial connector on Paragon-X; to allow testing of of ToD and 1pps on combined interfaces, the Calnex 1pps/ToD/Frequency converter is used. **For more information on the converter, please refer to the *Paragon-X Getting Started Guide*, and *16X Release Notes*, available from the Paragon-X GUI, or installed documentation folder.**

Paragon-X allows you to setup ITU-T ToD messages by enabling 'GPS Emulation'. First of all you need to select: **Master/Slave/GPS Emulation** then under **Device Configuration** select the **GPS Emulation** tick box.

Select **Configure** and then you will see the following **Master/Slave/GPS Emulation Setup** page.

Select **Message Type**: Choose **G8271**

Master

- General Settings
- VLAN Tags
- Multicast/Unicast
- Allowed Slaves
- Common Header
- Announce Message
- TLVs
- Management

Slave

- General Settings
- VLAN Tags
- Multicast/Unicast
- Allowed Master
- Common Header

GPS Emulation

- Time of Day

Calnex Paragon-X

Master Slave

D.U.T.

General

Message Type: G8271

The seed time will be set by the Paragon-X Master

Event Announce GNSS

Use settings from Master/Slave Emulation configuration

Current UTC Offset (s): 37

Event Flags

Leap 59 UTC Offset Valid Frequency Traceable

Leap 61 Time Traceable

You then have options to set up Event, Announce and GNSS messages. In the **Event** message, you can modify the **Time Source Type** and **Time Source Status** fields as well as the **Time Source Alarms**.

The **Announce** message essentially works like a virtual PTP announce message, and gives control over the equivalent fields. These can be populated directly from the Paragon-X PTP Master/Slave Emulation configuration by selecting the appropriate tickbox:

The screenshot shows a configuration window for PTP messages. It has three tabs: 'Event', 'Announce', and 'GNSS', with 'Announce' currently selected. At the top, there are three checkboxes: 'Event' (checked), 'Announce' (checked), and 'GNSS' (checked). Below this is a checkbox for 'Use settings from Master/Slave Emulation configuration' which is unchecked. The main area contains several input fields and dropdown menus: 'Domain' (0), 'Priority 1' (0), 'Priority 2' (0), 'Offset Scaled Log Variance' (00 00), 'Clock Class' (6), 'Clock Accuracy' (25 ns), 'Clock Identity' (00 00 00 00 00 00 00 01), 'Port Number' (00 01), 'GM Clock Identity' (00 00 00 00 00 00 00 01), 'Steps Removed' (0), and 'Time Source' (Atomic Clock). Below these is a section titled 'Announce Flags' with several checkboxes: 'PTP Leap 59', 'PTP Leap 61', 'Alternate Master', 'PTP Profile 2', 'PTP Timescale', 'Current UTC Offset Valid', 'Unicast', 'Time Traceable', 'Frequency Traceable', and 'PTP Profile 1'. The 'Time Traceable' and 'Frequency Traceable' checkboxes are checked.

For the **GNSS** message, **Time Source Type** you can select, for example: **Beidou, GPS or PTP**. There is also the option to enter a user-defined value for test purposes or to support any future changes in the standard. For **Time Source Status** you can select and modify the following status fields: **No Fix, Dead Reckoning, 2D Fix, 3D Fix, GPS + Dead Reckoning** and **Time Fix Only**. Once again, it is possible to enter a user-defined value. Alarms can also be transmitted. Note that each alarm is a separate bit and so multiple alarms can be generated simultaneously.

A number of these settings (such as values in the **Announce** message) can be modified while the ToD generation functionality is running. This can be accomplished by making the required changes and then clicking **Apply Changes** in the bottom left of the configuration screen. This allows you to test the dynamic behavior of your device and verify that it responds correctly to changes in its time reference.

With Time of Day **capture** enabled, results can be loaded into **PFV** for analysis of Time of Day messages against expected fields and values, and into **CAT** to display alongside 1pps Time Error results.

4.2 Timeplane adjustment for Industrial application testing (requires Option 252: Peer-to-Peer Master Slave Emulation)

As defined in the PTP industrial profile IEEE 802.1AS-Rev, devices in a system are marked as not gPTP capable (and hence cannot participate in timing exchange) if there is a path delay of greater than 800ns between systems.

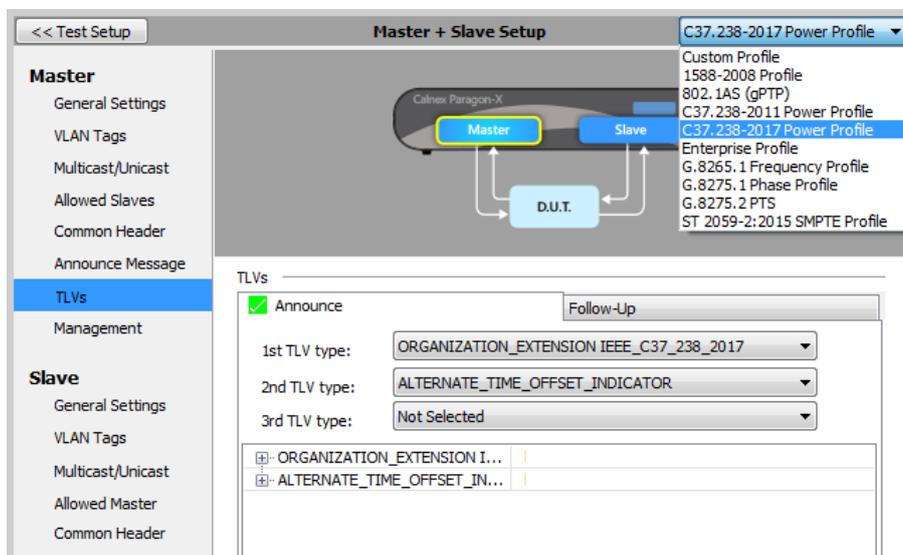
To allow the full range of stress-testing capabilities of Paragon-X, while ensuring that the gPTP conditions are met by default, this release enables a Timeplane adjustment within the Peer-to-Peer PTP emulation capability. Timestamping is effectively moved to the edge of the Paragon-X unit, resulting in path delays which are solely due to the length of cable used and therefore well within the 800ns threshold.

Note that the Paragon-X delay impairment can be used to move the path delay beyond this limit, to confirm a DUT recognises this threshold being broken, and responds accordingly.

4.3 2017 Power Profile support (requires Option 252: Peer-to-Peer Master Slave Emulation)

As an outcome of collaboration between the IEEE and IEC, the 2017 version of the IEEE PTP Power Profile (IEEE C37.238-2017) is defined such that it can be a superset of parameters built on-top of the IEC 'Utility' profile. The resulting changes versus the 2011 Power Profile are mostly subtle, meaning robust definition of generated message parameters is essential in confirming compliance and interoperability.

The 2017 Power Profile is now available as an 'auto-configure' drop-down option in the Master/Slave emulation configuration page. Users can also adjust parameters, and will be notified if they have moved outside of the acceptable ranges of values, as the Profile selection will move to 'Custom'.



Note that the 2011 Power Profile selection is still available, which in combination with the updated profile is useful for testing interoperability and performance issues in devices and systems in the event of mismatching implementations being used (note that backwards-compatibility is a defined feature of the 2017 profile.)

4.4 PFV: 2017 Power Profile support (requires Option 950: PFV)

As mentioned in the above section, this release enables support for both the current and previous versions of the IEEE Power Profile – this also applies to the message decode and Pass/Fail analysis capability of PFV:

Direction	Packet #	Arrival Time	Inter Message Time	Message Type	transportSpecific	versionPTP	reservedField0
					0x0	0x2	0x0
← 2	1774	591.00001335	1.00000000	PDEL-REQ	0x0	0x2	0x0
→ 2	1775	591.00002448	1.00000000	PDEL-RESP	0x0	0x2	0x0
→ 2	1776	592.00000000	1.00000000	SYNC	0x0	0x2	0x0
← 2	1777	592.00001335	1.00000000	PDEL-REQ	0x0	0x2	0x0
→ 2	1778	592.00002448	1.00000000	PDEL-RESP	0x0	0x2	0x0
→ 2	1779	593.00000000	1.00000000	SYNC	0x0	0x2	0x0
← 2	1780	593.00001335	1.00000000	PDEL-REQ	0x0	0x2	0x0
→ 2	1781	593.00002448	1.00000000	PDEL-RESP	0x0	0x2	0x0
→ 2	1782	594.00000000	1.00000000	SYNC	0x0	0x2	0x0
← 2	1783	594.00001335	1.00000000	PDEL-REQ	0x0	0x2	0x0
→ 2	1784	594.00002448	1.00000000	PDEL-RESP	0x0	0x2	0x0
→ 2	1785	595.00000000	1.00000000	SYNC	0x0	0x2	0x0
← 2	1786	595.00001335	1.00000000	PDEL-REQ	0x0	0x2	0x0
→ 2	1787	595.00002448	1.00000000	PDEL-RESP	0x0	0x2	0x0
→ 2	1788	596.00000000	1.00000000	SYNC	0x0	0x2	0x0
← 2	1789	596.00001335	1.00000000	PDEL-REQ	0x0	0x2	0x0
→ 2	1790	596.00002448	1.00000000	PDEL-RESP	0x0	0x2	0x0
→ 2	1791	597.00000000	1.00000000	SYNC	0x0	0x2	0x0
← 2	1792	597.00001335	1.00000000	PDEL-REQ	0x0	0x2	0x0
→ 2	1793	597.00002448	1.00000000	PDEL-RESP	0x0	0x2	0x0
→ 2	1794	598.00000000	1.00000000	SYNC	0x0	0x2	0x0
← 2	1795	598.00001335	1.00000000	PDEL-REQ	0x0	0x2	0x0
→ 2	1796	598.00002448	1.00000000	PDEL-RESP	0x0	0x2	0x0

Average Message Rate (msg/sec)		
SYNC	1.00	FOLLOW-UP
PDEL-RESP	1.00	ANNOUNCE

4.5 PFV: SMPTE Broadcast Profile support (requires Option 950: PFV)

As mentioned in the above section, this release enables support for the SMPTE ST-2059-2 Broadcast Profile – this also applies to the message decode and Pass/Fail analysis capability of PFV, with versions available for both end-to-end and peer-to-peer implementations:

Direction	Packet #	Ruleset File	versionPTP
→ 2	177	1588-2008.xml	
→ 2	177	802.1AS(gPTP).xml	
→ 2	177	C37.238-2011_Power_Profile.xml	
→ 2	177	C37.238-2017_Power_Profile.xml	
→ 2	177	Enterprise_Profile.xml	
→ 2	177	G.8265.1_Frequency_Profile.xml	
→ 2	177	G.8275.1_Phase_Profile.xml	0x2
→ 2	177	G.8275.2_PTS_Profile.xml	0x2
← 2	177	SMPTE_ST_2059-2_2015(end-to-end).xml	0x2
→ 2	177	SMPTE_ST_2059-2_2015(peer-to-peer).xml	0x2
→ 2	177	CCSA.xml	0x2

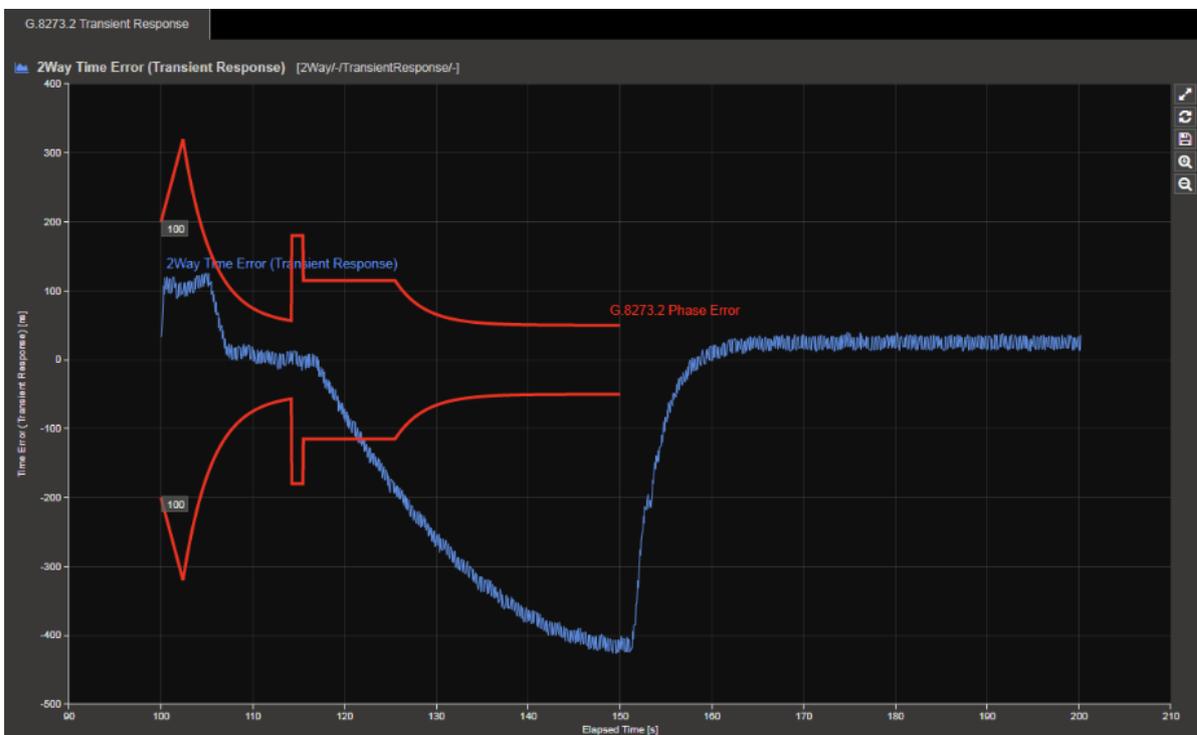
4.6 PFV: Enhanced Inter-message gap/message rate testing (requires Option 950: PFV)

In addition to existing message rate checking with Pass/Fail provided by PFV, in this release there are also additional tests provided to compare the Inter-message gap of received messages with both the standards-defined inter-message period, and where appropriate the associated LogMessageInterval value – for example ensuring Announce inter-message gap is within 30% of the LogMessageInterval carried in those messages.

These values and pass/fail results are displayed in a new column in PFV, *Inter-message time*.

4.7 CAT: Positive/Negative 2way TE Transient Response mask

To allow assessment of DUT performance when responding to a phase transient as defined in ITU-T G.8273.2 Clause 7.4.1.2, with positive or negative excursions during each the two defined phase jumps, the applied limit mask in CAT is now two-sided, to cover the worst case performance (caused by ‘double positive’ or ‘double negative’ excursions).



Appendix A: Software Advisory Notes

- When measuring time error at 100M, MSE should be started **before** the capture is started. If MSE and capture are started at the same time, then a time error offset of 40ns may occasionally be measured.

To start MSE separately from capture, in MSE, configure the filters required and press “Set”; **then** start MSE. After a few seconds, start the capture.

- Port 2 link must be up (Rx connection in place to port 1 Tx) in order to allow Port 2 Tx to function in Packet Generation mode.
- Script recorder does not support manual setting of filters through ‘flow filter’ in Through Mode operation. This can be addressed by saving filter settings and then recalling the saved settings in your script.

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