

Calnex Paragon - *x*

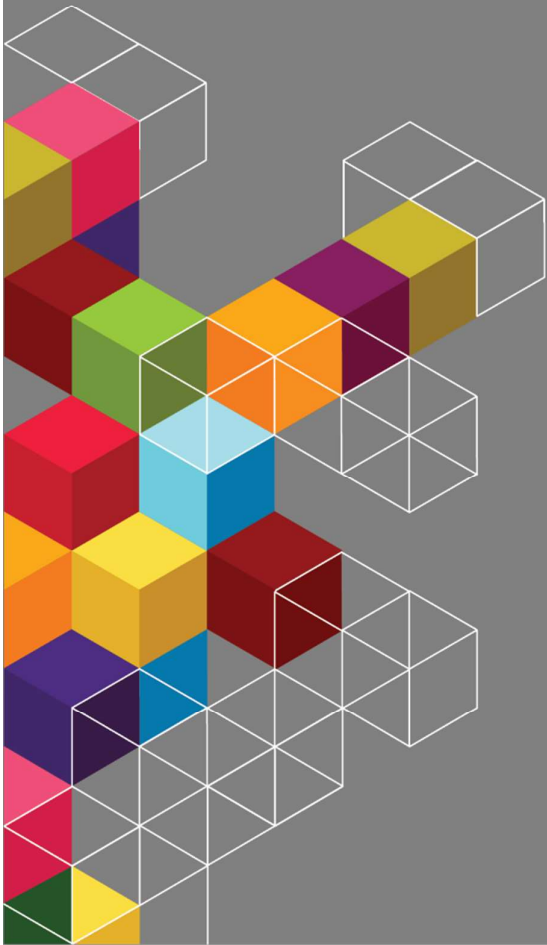


Software Release 30X

(X.10.43.xx)

April 2024

NEW FUNCTIONALITY AND ENHANCEMENTS




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1 Software Release Overview

Release 30X (X.10.43.xx) adds the following features to Paragon-X

SUS (Software Upgrade Service)



New Options	Enhancements to existing Options	Base product enhancements
None	None	Enhances 802.1AS test capability Support for 100/1000BASE-T1 SFPs General Defect Fixes

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

2 Features and Benefits

Paragon-X	Benefit
New Options	No new options
Enhancements to existing Options	No enhancements to existing options
Base product enhancements	<ol style="list-style-type: none"><li data-bbox="751 457 1417 751">1. Paragon-X software release 30X enhances measurement functionality for testing 802.1AS networks and devices. Additional metrics added to Through Mode operation enable testing synchronization of 802.1AS networks where cable lengths are unknown. Master-Slave Emulation provides test functions to characterize Grand Master clocks (both with and without independent reference source), Time Aware Switches and Time Aware End Stations (including Reverse Sync).<li data-bbox="751 793 1417 886">2. Paragon-X now supports 100BASE-T1 and 1000BASE-T1 SFP interfaces, in addition to 100/1000BASE-T and 100/1G/10G optical interfaces.

3 Base Product Enhancements

Paragon-X software release 30 (10.43.xx) introduces several features to assist measuring PTP timing performance in 802.1AS Ethernet networks and equipment.

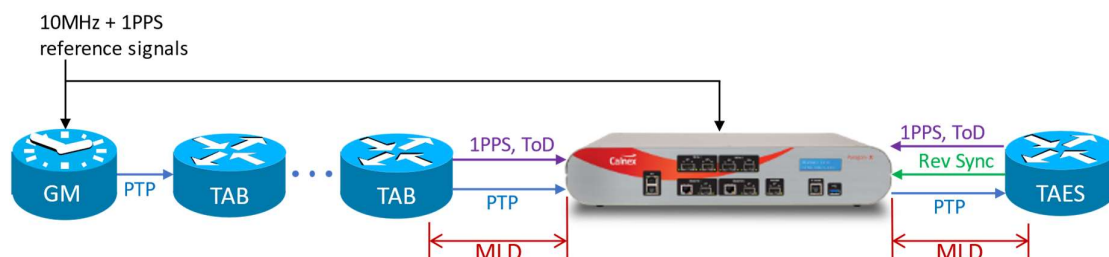
- Support for 100/1000BASE-T1 interfaces added.
- Support for Measured Link Delay (MLD) to estimate latency between devices where the link latency is unknown. Use of MLD is required when testing devices that use software timestamping.
- Support for through-mode testing in free running networks that have no external reference.
- Support for testing free running 802.1AS Grand Masters (GM) that have no reference.
- Support for testing 802.1AS Time Aware End Stations that support AVNU Reverse Sync messages.

3.1 Through Mode Network Test

Prior to software release 30X, Paragon-X Through Mode only allowed time error testing against the upstream master measuring time error against a common reference. Software release 30X adds the ability to test time error of a downstream 802.1AS device that transmits Reverse Sync messages (e.g. a Time Aware End Station) and for networks where there is no reference signal available. The new Through Mode time error measurement capability is described in Calnex product note CX5047.

The diagram below shows Paragon-X in one path of an 802.1AS network from the GM, through Time Aware Bridges (TAB) to a Time Aware End Station (TAES). The TAES may generate Reverse Sync messages and/or a 1PPS output that Paragon-X can measure. The TABs may also generate 1PPS and Time of Day (ToD) outputs that Paragon-X can measure.

If the network GM uses a reference input (e.g. GNSS), connecting 10MHz and 1PPS reference signals derived from the same reference source ensures that Paragon-X takes the most accurate measurements. If no references are available, Paragon-X will use its internal oscillator with a maximum drift of 4.6ppm.

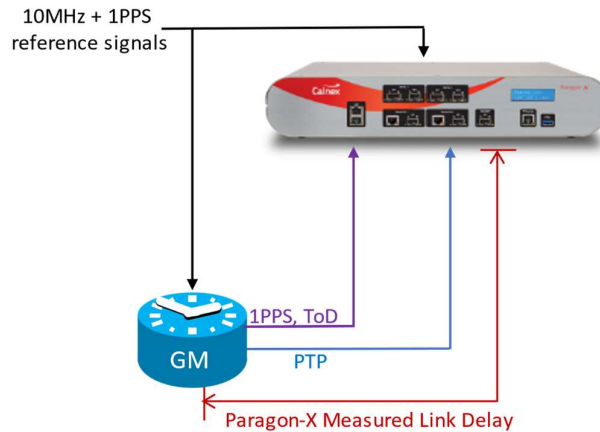


Timestamp points in the upstream and downstream devices can be implemented in software and hence “inside the box”. This results in measured link delays that include elements of the device egress and ingress latencies (implied in the diagram).

3.2 MSE Master Test

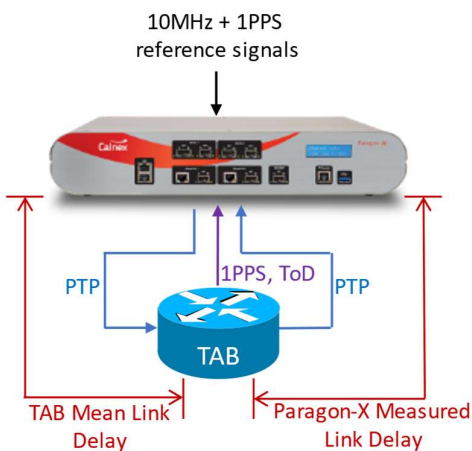
The MSE Master Test mode is used for testing 802.1AS Grand Master devices with connections shown in the diagram.

Typically, GMs operate with a reference input (e.g. GNSS) but may also be required to operate for extended periods of holdover when the reference signal is lost (e.g. a GM in a car in a basement car park). The GM's long term holdover accuracy can be tested by disconnecting its reference signal while Paragon-X remains referenced. Recovery from holdover must also be tested when the GM's reference signal is reconnected.



An alternative timing network architecture uses an 802.1AS GM that does not have a reference input and relies solely on the GM's internal oscillator to keep time – the GM effectively only ever operates in free-run mode. Such a network may be useful in an entirely self-contained timing environment. Long-term tests (more than 24 hours) will provide insight to the stability of the GM. Tests should also take account of the environmental conditions (temperature, humidity, vibration, electrical noise, etc) that the GM is expected to encounter in the final application.

3.3 MSE Mode Time Aware Bridge Test



Paragon-X can test 802.1AS Time Aware Bridges with connections shown in the diagram. The Time Aware Bridge takes a PTP input from the Paragon-X Master and outputs a PTP signal to the Paragon-X Slave. Additionally, the TAB may output 1PPS and ToD signals that can be measured by Paragon-X.

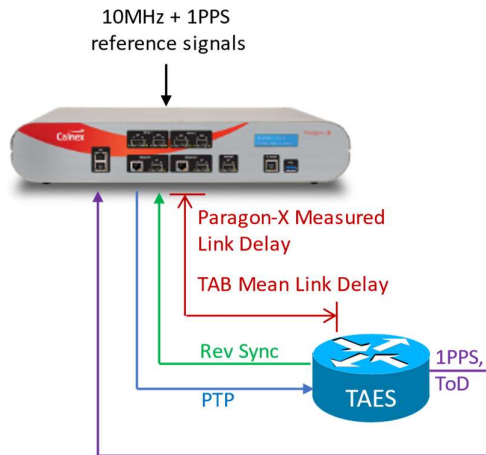
Timestamp points in TABs can be implemented in software and hence "inside the box". This results in measured link delays that include elements of the TAB ingress and egress latencies (implied in the diagram).

MSE mode TAB tests can be run with or without external references to Paragon-X.

A TAB may have input and output Ethernet ports that are different interface types and speeds. Paragon-X ports must be set to uncoupled to handle different interface speeds and types.

3.4 MSE Mode Time Aware End Station Test

An 802.1AS Time Aware End Station (TAES) should be connected to Paragon-X as shown in the diagram. The TAES takes a PTP input from the Paragon-X Master and outputs one or both of Reverse Sync messages and a 1PPS signal. Paragon-X measures the Reverse Sync, 1PPS and ToD signals to determine how accurately the TAES is maintaining time.



Note – Reverse Sync is an extension to 802.1AS proposed by the AVNU organization.

The timestamp point in a TAES can be implemented in software and hence “inside the box”. This results in measured link delays that include elements of the TAES ingress and egress latencies (shown in the diagram).

Paragon-X can operate in single or dual master configurations when running a TAES test. The dual master configuration (not shown in the diagram) is useful for testing best master switch over on TAES devices that have multiple PTP input ports.

Paragon-X MSE mode TAES tests can be run with or without external reference to Paragon-X.

3.5 Support for 100BASE-T1 and 1000BASE-T1 SFP Transceivers

Paragon-X software release 30X adds support for 100BASE-T1 and 1000BASE-T1 SFPs. The following SFPs are supported –

- Hicotel HICSGT1FTM 100BASE-T1 transceivers
- Hicotel HICSGT1GTM 1000BASE-T1 transceivers
- Intrepid SFP-MV2112-A2 100/1000BASE-T1 transceivers
- Technica PT-1441 T1 transceivers - 100M + 1G mode

4 New and Updated Documentation

Updates to the documentation included in the Paragon-X software release 30X are –

- Paragon-X Getting Started Guide (updated)
- CX5009 Cabling Considerations (updated)
- CX5047 Using ParagonX 30X to test 802.1as Networks & Devices (new document)
- CX3015 Time Aware End Station Test Guide (new document)
- CX5020 G.8273.2 T-TSC Conformance Test Guide (updated)
- CX5008 G.8273.2 T-BC Conformance Test Guide (updated)
- CX5021 G.8273.3 T-TC Conformance Test Guide (updated)
- Paragon-X Remote Control Manual (updated)
- CAT Remote Control Manual (updated)
- PFV Remote Control Manual (updated)

Documents are installed as part of the 30X software installation. Documents can be accessed from the Paragon-X GUI Help menu.

5 Software Advisory Notes

For more information on features and fixes in this Release, along with other user information on Calnex products, please visit the Knowledge Base at:

<https://calnexsolutions.atlassian.net/wiki/spaces/KB/overview>

- 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.
- 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.
- When using IPv6 encapsulation in MSE, it is possible that the Paragon-X slave could generate some Delay-Request messages with an incorrect UDP checksum.
- Paragon-X through mode operation with 100BASE-T and 1000BASE-T connections may fail when there is significant traffic in addition to PTP traffic. Setting the flow filters to monitor only PTP packets resolves the issue.
- Occasionally the Paragon-X software may be unable to connect to the instrument after applying a software update. Solution is to power cycle the Paragon-X instrument and reconnect.
- Transparent clock time error tests using 10G XFP transceivers generate inaccurate time error measurements. Use 10G SFP+ transceivers instead when running transparent clock tests for accurate time error measurements.
- When two 100BASE-T1 or 1000BASE-T1 SFP transceivers are being inserted to Paragon-X, insert them one at a time. After inserting each transceiver, wait for the link status LED on the Paragon-X GUI to show that the transceiver is recognised.



Calnex Solutions plc
Oracle Campus
Linlithgow
West Lothian
EH49 7LR
United Kingdom

tel: +44 (0) 1506 671 416
email: info@calnexsol.com

calnexsol.com

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