

Solve the timing challenges of 5G



Supporting your changing environment

As the world prepares for 5G, the levels of synchronization accuracy and speed of data transfer required are increasing exponentially. In response, the ITU-T is enhancing the G.827x series of standards to cover next-generation accuracy requirements – to ensure that Ethernet systems are robust against varying transmission delays and other effects that can significantly disrupt the precise transfer of timing.

The Paragon-neo is the latest platform from Calnex, providing PTP and SyncE testing of speeds up to 100GbE. It's designed to meet the stringent test requirements of NEMs who are developing, verifying and manufacturing devices against enhanced timing standards such as for ITU-T G.8273.2 Class-C/D Boundary Clocks. And for those designing and deploying 5G networks and systems.

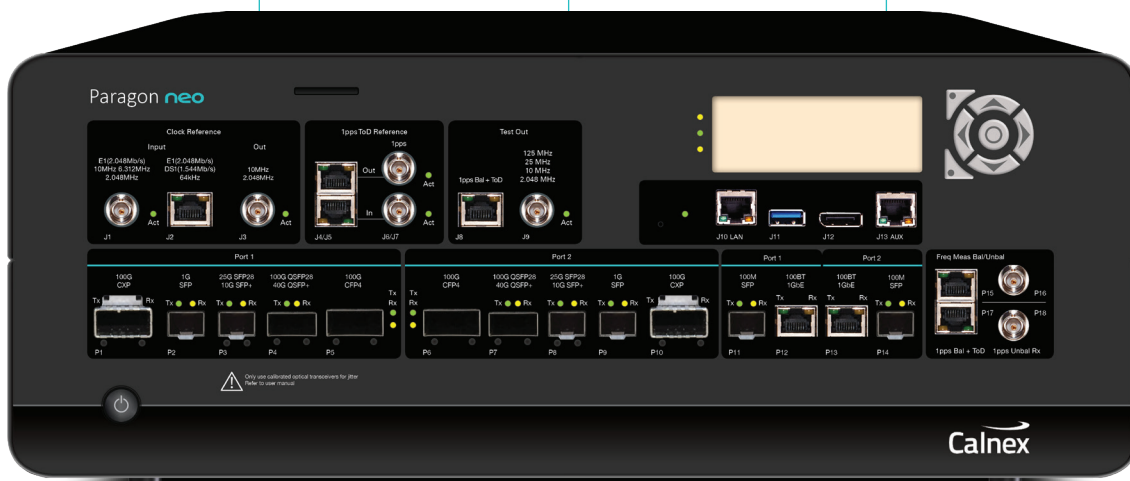
What's more, because high network efficiency and reduced data transmission costs are only possible with highly accurate timing, Paragon-neo offers hardware performance and software test methodologies allowing *sub-nanosecond accuracy* for the entire test system.

To meet the timing challenges of 5G deployments, Calnex is committed to providing the most advanced, precise and reliable test solutions to make sure your devices and systems deliver the high quality network services of the future. In a changing world, it's good to know that some things never change.

Analyse PTP conformance to standards-based or user-defined profiles, with automatic indication of pass/fail (and reason for non-compliance) and report generation.

Generate SyncE wander and jitter for ITU-T G.8262.1/G.8262 testing, simultaneously measure SyncE wander and PTP Time Error, and control ESMC message generation for testing to ITU-T G.8264.

Emulate PTP Master and Slave clocks to maximise accuracy and repeatability of PTP test, including specific test modes for various DUTs and automatic test selection for ITU-T standards conformance.



PTP Field Verifier (PFV)

- Analyze PTP protocol for conformance to standards or user-defined profiles.
- Automatic pass/fail indication – check captured PTP messages against a pre-defined set of rules, with clear pass/fail alerts.

Direction	Packet #	Arrival Time	messageType	reserved	sourcePortIdentity	sequenceId	logMessageInterval	PTP Body Fields
DEL-REQ	0	0.000000000	SYNC	0x0	0x4f4c2f0000000000	19826	-4	origTimestamp-2013 312 22 22 22 43003
DEL-REQ	1	0.006374565	DEL-REQ	0x0	0x0000000000000000	38231	127	origTimestamp-2013 312 06 21 27 46503
DEL-REQ	2	0.006818865	DEL-REQ	0x0	0x4f4c2f0000000000	38231	-4	recvTimestamp-2013 312 06 21 27 46578
DEL-REQ	3	0.033091940	SYNC	0x0	0x4f4c2f0000000000	19827	-4	origTimestamp-2013 312 22 22 22 43003
DEL-REQ	4	0.059970000	SYNC	0x0	0x4f4c2f0000000000	19828	-4	origTimestamp-2013 312 06 21 27 46503
DEL-REQ	5	0.068745855	DEL-REQ	0x0	0x0000000000000000	38232	127	recvTimestamp-2013 312 06 21 27 46578
DEL-REQ	6	0.069380700	DEL-REQ	0x0	0x4f4c2f0000000000	38232	-4	origTimestamp-2013 312 22 22 22 43003
DEL-REQ	7	0.069025580	SYNC	0x0	0x4f4c2f0000000000	19829	-4	origTimestamp-2013 312 06 21 27 46503
DEL-REQ	8	0.120254645	SYNC	0x0	0x4f4c2f0000000000	19830	-4	recvTimestamp-2013 312 06 21 27 46578
DEL-REQ	9	0.131374565	DEL-REQ	0x0	0x0000000000000000	38233	127	origTimestamp-2013 312 22 22 22 43003
DEL-REQ	10	0.131843375	DEL-REQ	0x0	0x4f4c2f0000000000	19831	-4	origTimestamp-2013 312 06 21 27 46503
DEL-REQ	11	0.150113205	SYNC	0x0	0x4f4c2f0000000000	19832	-4	recvTimestamp-2013 312 06 21 27 46578
DEL-REQ	12	0.160245560	SYNC	0x0	0x4f4c2f0000000000	38234	-4	origTimestamp-2013 312 22 22 22 43003
DEL-REQ	13	0.160874565	DEL-REQ	0x0	0x0000000000000000	38235	127	origTimestamp-2013 312 06 21 27 46503
DEL-REQ	14	0.194430555	DEL-REQ	0x0	0x4f4c2f0000000000	19833	-4	recvTimestamp-2013 312 06 21 27 46578
DEL-REQ	15	0.210040120	SYNC	0x0	0x4f4c2f0000000000	19834	-4	origTimestamp-2013 312 22 22 22 43003
DEL-REQ	16	0.240021620	SYNC	0x0	0x4f4c2f0000000000	19835	-4	origTimestamp-2013 312 06 21 27 46503
DEL-REQ	17	0.256374565	DEL-REQ	0x0	0x0000000000000000	38236	127	recvTimestamp-2013 312 06 21 27 46578
DEL-REQ	18	0.256910205	DEL-REQ	0x0	0x4f4c2f0000000000	19836	-4	origTimestamp-2013 312 22 22 22 43003
DEL-REQ	19	0.270000055	SYNC	0x0	0x4f4c2f0000000000	19837	-4	origTimestamp-2013 312 06 21 27 46503
DEL-REQ	20	0.300007255	DEL-REQ	0x0	0x4f4c2f0000000000	38237	-4	recvTimestamp-2013 312 06 21 27 46578
DEL-REQ	21	0.318074565	DEL-REQ	0x0	0x0000000000000000	19838	127	origTimestamp-2013 312 22 22 22 43003

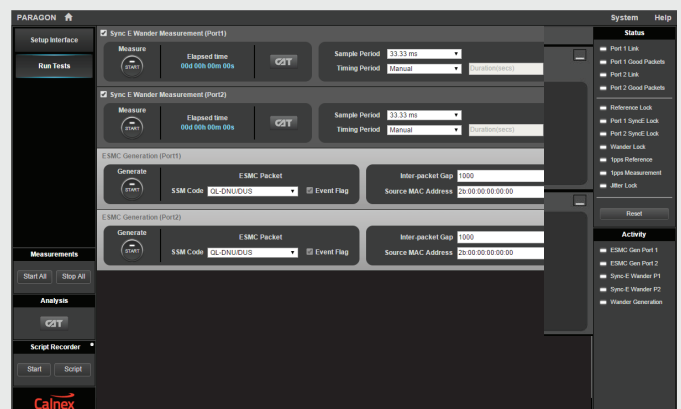
Average Message Rate (msg/sec):
SYNC 23.73 FOLLOW-UP 0.00 ANNOUNCE 0.00
DEL-REQ 15.93 DEL-REQ 10.20 SIGNALING 1.35

Total Counts: 302
Error Count: 10

FAIL
Total Pass Rate: 96.69%

Conformance Test Application

- Start testing in seconds – just two clicks to configure crucial standards-defined test sequences.
- Automatically generates PTP and ESMC messages, Time Error and SyncE impairments, and applies filters, metrics and masks.

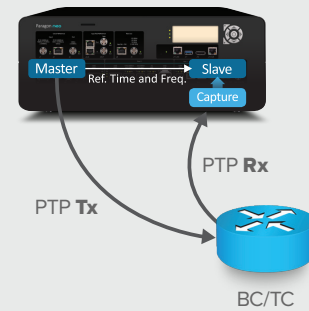




- Analyze the Time Error (TE) of, for example, Class-C/D T-Boundary Clocks or Class-B PRTC/Master Clocks.
- Apply standards-defined Time Error impairments.
- Combine with SyncE and ESMC for complex tests such as Phase Noise Response to SyncE Transient.

PTP Applications

Test hybrid devices simultaneously with PTP Time Error/ SyncE wander and measure output packet timing, recovered clocks and SyncE wander with unbeatable test accuracy and repeatability.



Application

Boundary Clock Testing

Transparent Clock Testing

Assisted Partial Timing Support Clock Testing

Master Clock Testing

Slave Clock Testing

Standard

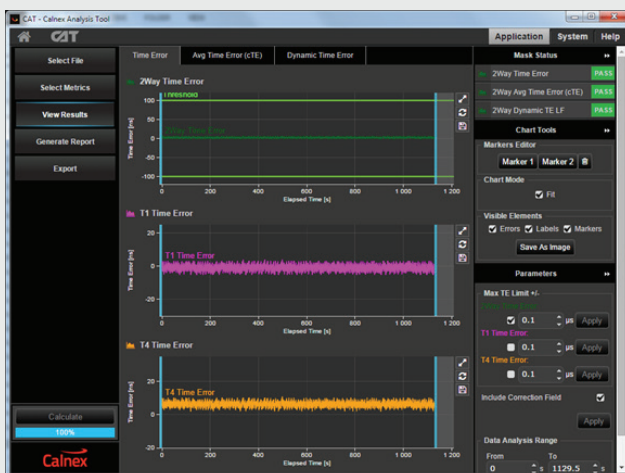
ITU-T G.8273.2

ITU-T G.8273.2

ITU-T G.8273.4

ITU-T G.8272

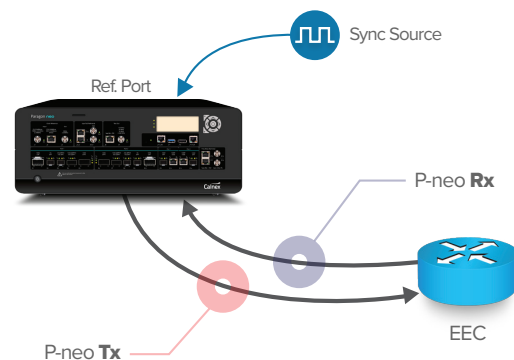
ITU-T G.8273.2



The Calnex Analysis Tool (CAT) provides powerful insight into network and device performance. All your measurement results are now in one place, and you can view multiple graphs simultaneously for easier correlation of your results. Plus, with enhanced graphics, it's easy to evaluate ITU-T metrics such as MTIE and TDEV against ITU-T masks.

SyncE Applications – ITU-T G.8262.1/G.8262 (Jitter and Wander)

The Paragon-neo supports full SyncE testing up to 100GbE to ITU-T G.8262.1/G.8262 including Wander Tolerance, Wander Transfer, Wander (Noise) generation, Pull-in, Hold-in and Pull-out ranges, Frequency Accuracy and Phase Transient, plus Jitter Tolerance and Jitter Generation.



Application

SyncE Jitter Generation

SyncE Jitter Tolerance

SyncE Wander (noise) Generation

SyncE Wander (noise) Tolerance

SyncE Wander (noise) Transfer

SyncE Short Term Phase Transient

P-neo Tx

Jitter free

Apply Jitter

Wander free

Apply Wander

Apply Wander

Break line or set ESMC QL=DNU

P-neo Rx

Measure Jitter

Check Test Packets

Measure Wander

Check ESMC

Measure Wander

SyncE TIE, MTIE

PTP Performance Summary

- Capture and decode PTP packets for analysis and Time Error testing.
- PTP Master/Slave emulation, plus the Paragon-neo's unique conformance test application, removes uncertainty and maximizes test repeatability – essential for validating new, high-accuracy 5G network devices.
- Automatic test of PTP profile compliance for simple and reliable verification against standards-based or user-defined profile configurations.

SyncE Performance Summary

- Prove SyncE wander performance to ITU-T G.8262.1/G.8262.
- Evaluate MTIE/TDEV pass/fail results to ITU-T G.8262.1/G.8262 masks.
- Check ESMC (SSM) messaging to ITU-T G.8264.
- Test SyncE jitter performance to ITU-T G.8262.1/G.8262.