

Testing Primary Reference Time Clocks (PRTC) in 5G and other Packet Networks

Time, phase, and frequency synchronisation are key enablers for 5G and Next-Generation Networks. In order to meet these requirements developers, integrators, and operators need to optimise and verify the performance of their PRTCs/ePRTCs

ITU-T Recommendations

The ITU set of recommendations for precision timing in telecommunications networks includes standard G.8272 for PRTC and ITU G.8272.1, for enhanced PRTC (ePRTC). They set out the maximum deviation from UTC that the PRTC data output can exhibit without affecting service quality on the network, as well as requirements on wander, jitter and holdover.

Fundamentals

Establish the baseline accuracy of the PRTC in normal operating conditions and ensure the PRTC continues to provide correct reference time when predictable but infrequent GNSS system events happen. These include leap year, leap seconds and GPS week number rollover, the next one happening on April 6, 2019.

PRTC/ePRTC

Performance

Check the PRTC's timing solution when it is positioned under typical daily impairments such as multipath and obscuration, and verify the receiver RAIM functionality when segment errors such as satellite clock or ephemeris errors happen.

Resilience

The low signal strength of GNSS reception-signals on the earth and the widely disclosed GNSS signal format bring vulnerabilities of signal jamming, atmospheric (scintillation and space weather) and location or time spoofing. Whether you are developing, integrating, or just using a PRTC, you need to ensure PRTC resilience to avoid errors and disruption.

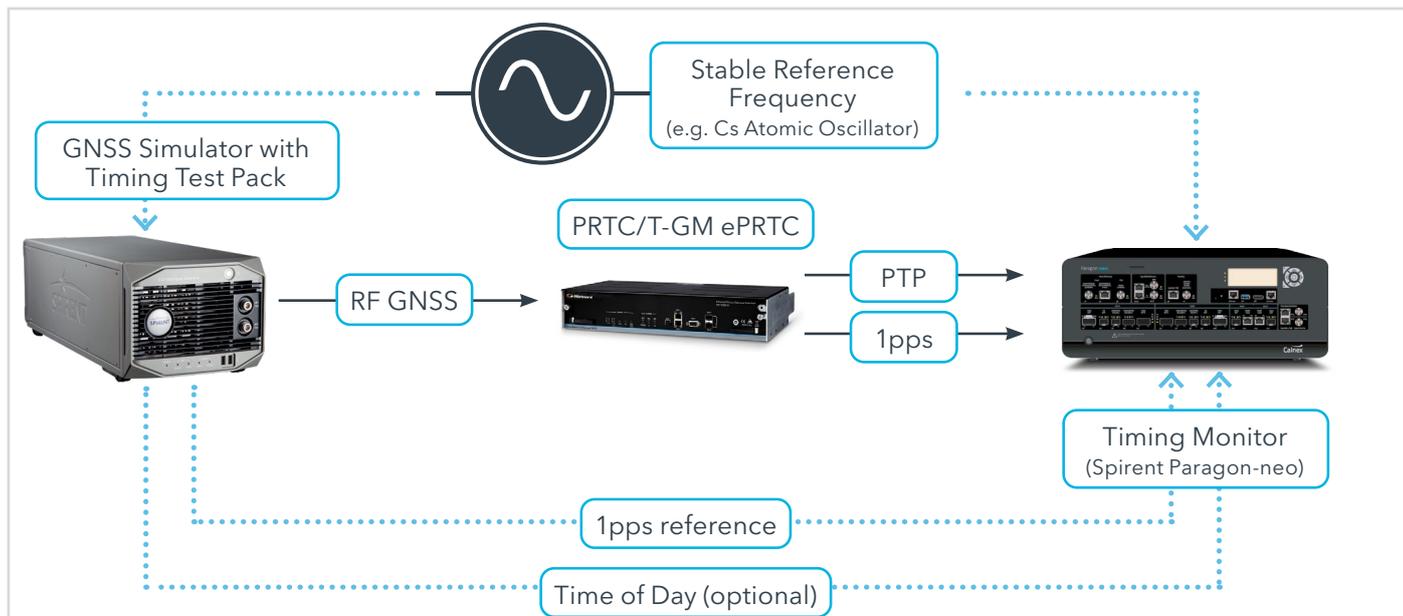
Vendor Selection

Network equipment manufacturers must ensure they take an informed decision when choosing a GNSS timing receiver. With an ever-growing number of multi-constellation and multi-frequency receivers on the market, the choice is not easy. Getting analytical test results by thoroughly evaluating receivers is key to help that decision.

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How can Spirent Help?

The only way to thoroughly validate and evaluate the performance and resilience of your timing infrastructure is via scientific testing. As PRTCs provide the reference time signal used by time protocols such as PTP, developers, integrators and users need to ensure their equipment meets the tight synchronisation requirements. The reliance of PRTCs on GNSS for the original time reference means structured and thorough GNSS testing is a key requirement.



GNSS Simulation: GSS7000

The Spirent GSS7000 is a versatile and powerful multi-GNSS, multi-frequency constellation simulator for all test use cases. Fully customisable according to your needs, with features including:

- Simulate up to 256 satellites simultaneously
- Precise signal output - 1PPS to RF alignment <math>< \pm 2\text{ns}</math>
- 10 MHz and 1 PPS outputs and inputs
- Multipath simulation

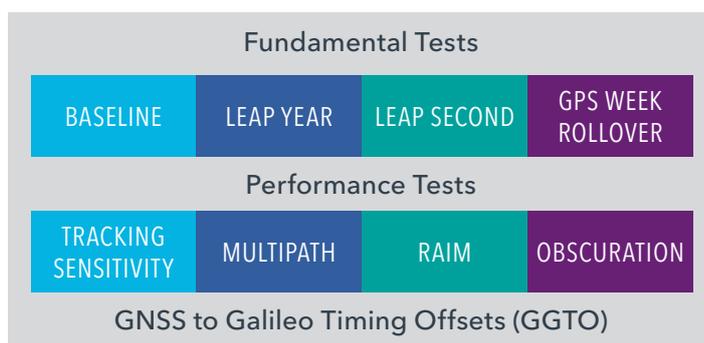


GPS L1 C/A	GLONASS L1 C/A	GALILEO E5 a/b	BeiDou-3 B1C	QZSS L1	QZSS L6
GPS L2 C/A	GLONASS L2 C/A	BeiDou-2 B1I	BeiDou-3 B2A	QZSS L2	IRNSS L5
GPS L5 I/Q	GALILEO E1 OS	BeiDou-2 B2I	BeiDou-3 B3I	QZSS L5	SBAS

Timing Scenario Set

The right test equipment provides all the means to evaluate and improve your timing synchronisation. However, without the right tests being run it can be useless. A predefined set of scenarios built by experts takes much of the time, worry, and even cost out of testing.

Spirent Timing Scenario Set provides all of the cases needed to test the performance and resilience of your PRTC, using one or several major GNSS.



Timing Monitor: Paragon-neo

High-accuracy measurement is a basic prerequisite of timing and synchronisation test solutions. Real-time sub-nanosecond measurement of PTP and 1pps/ ToD outputs from the PRTC, compared to the direct 1pps reference from the simulator, provide powerful, reliable verification of device performance.

Paragon-neo is Spirent's one-box solution to test PTP and precision of the PRTC to the stringent requirements of 5G.



Resilient PNT

GNSS interference can take different forms, for instance signal harmonics from a defective telecommunications antenna in a city centre or a jammer used by a passing truck driver. It is very important to both understand and test against the threat to improve the resiliency of a PRTC.

Spirent provides a range of products to assist in boosting the resilience of your system, helping you to combat the effects of interference and spoofing:

GSS6450: capture and replay high fidelity RFI.

GSS7725: the GSS7725 is a low-cost interference generator, capable of play a broad of I/Q files.

SimSAFE: test the resilience of your chipset against spoofing attacks.



1. Record and replay real world RFI

2. Test the PRTC against controllable RFI



About Spirent Communications

Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks.

We help bring clarity to increasingly complex technological and business challenges.

Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled.

For more information, visit:
www.spirent.com

Spirent Professional Services

Testing your timing equipment for every eventuality is essential. However, doing it properly can be very expensive. Spirent Professional Services are able to use Spirent's own monitors, simulators, and reference frequencies—bringing you the results you need faster, and at a lower cost.

Services include:

- Verify compliance to ITU-T G.8272/Y.1367 and ITU-T G.8272.1/Y.1367.1
- Test scenario creation for specific events
- Receiver Performance audit and report
- Receiver Resilience audit and report
- Interference detection and characterisation
- On-site and remote training services



Contact Us

For more information, call your Spirent sales representative or visit us on the web at www.spirent.com/ContactSpirent.

www.spirent.com

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Americas 1-800-SPIRENT
+1-800-774-7368 | sales@spirent.com

US Government & Defense
info@spirentfederal.com | spirentfederal.com

Europe and the Middle East
+44 (0) 1293 767979 | emeainfo@spirent.com

Asia and the Pacific
+86-10-8518-2539 | salesasia@spirent.com