From: pnt-eo@list.nist.gov on behalf of Hubert Kirrmann <hubert.kirrmann@solutil.ch>
Sent: Friday, May 29, 2020 9:25 AM
To: pnt-eo@list.nist.gov; Cleveland, Frances
Subject: [pnt-eo] Strenthening National Resilience through Responsible use of PNT Services

Hello Eric,

IEC 61850-90-4 (whose editor I am) recommends resiliency through diversity, given that there exists no protection against delaying timing signals.
A resilient timing service relies on a multitude of time sources and assumes that only a minority of time sources can be tampered with or disabled:

1) the own oscillator
2) a neighbour grandmaster clock not connected to a GNSS (e.g. a rubidium clock)
3) several GNSS clocks (GPS, Galileo, GLONASS, Beidou)
4) a network clock (ITU G.8264, etc..)
5) terrestrial radio (WWV, DCF77)

The first line of defence is a plausibility check that the timing signals are consistent and that no one presents a drift or step that is suspect.
The detection of such a situation should generate an alarm when a certain tolerance is exceeded.
The second line of defence is the constitution of a consensus among the timing sources, excluding timing sources that behave suspect or become unavailable.
The third line of defence is a fall-back on a clock that may have poorer quality, but is considered integer.

A particular problem arises because of the leap second issue in UTC.
To avoid tampering, an atomic clock should not be synchronized after it has been synchronized with the international time reference network.
Given the stability of atomic clocks, a resynchronization after a couple of months could be needed.
However, this separation could cause the atomic clock to miss the leap second announcement of BIPM-IERS and could cause a spurious error.
Also, there are hints that GLONASS does not handle the leap second the same way as other GNSS.
UTC offset and local time / daylight saving time offset should be treated separately, since these transitions can be anticipated well in advance over several channels. Therefore, a resilient timing should rely on TAI only.

Can this contribution be included in the recommendations?

Best regards

--
Prof. Dr. Hubert Kirrmann
www.solutil.ch
+41 79 252 23 03

--
To unsubscribe from this mailing list, send email to pnt-eo+unsubscribe@list.nist.gov
View this mailing list at https://list.nist.gov/pnt-eo