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TELECOMMUNICATION
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Packet over Transport aspects – Synchronization, quality and availability targets

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS, NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

Internet protocol aspects – Transport

Timing characteristics of enhanced primary reference time clocks

Recommendation ITU-T G.8272.1/Y.1367.1

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Recommendation ITU-T G.8272.1/Y.1367.1

Timing characteristics of enhanced primary reference time clocks

Summary

Recommendation ITU-T G.8272.1/Y.1367.1 specifies the requirements for enhanced primary reference time clocks (ePRTCs) suitable for time and phase synchronization in packet networks. It defines the error allowed at the time output of the ePRTC.

These requirements apply under the normal environmental conditions specified for the equipment.

History

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Recommendation ITU-T G.8272.1/Y.1367.1

Timing characteristics of enhanced primary reference time clocks

1 Scope

This Recommendation specifies the requirements for enhanced primary reference time clocks (ePRTCs) suitable for time, phase and frequency synchronization in packet networks. These requirements apply under the normal environmental conditions specified for the equipment.

The ePRTC provides a reference time signal traceable to a recognized time standard (e.g., coordinated universal time (UTC)) and also a frequency reference. Compared to the primary reference time clock (PRTC) as defined in [ITU-T G.8272], the ePRTC is subject to more stringent output performance requirements and includes a frequency input directly from an autonomous primary reference clock. The performance of the autonomous primary reference clock for this particular application is specified in Annex A.

An ePRTC provides the reference signal for time, phase, and frequency synchronization for clocks within a network or section of a network. In particular, the ePRTC can also provide the reference signal to the telecom grand master (T-GM) within the network node where the ePRTC is located.

This Recommendation defines the ePRTC output requirements. The requirements for the ePRTC integrated with a T-GM clock are for further study.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T G.703] Recommendation ITU-T G.703 (2016), *Physical/electrical characteristics of hierarchical digital interfaces*.

[ITU-T G.810] Recommendation ITU-T G.810 (1996), *Definitions and terminology for synchronization networks*.

[ITU-T G.811] Recommendation ITU-T G.811 (1997), *Timing characteristics of primary reference clocks*.

[ITU-T G.8260] Recommendation ITU-T G.8260 (2015), *Definitions and terminology for synchronization in packet networks*.

[ITU-T G.8271] Recommendation ITU-T G.8271/Y.1366 (2016), *Time and phase synchronization aspects of packet networks*.

[ITU-T G.8272] Recommendation ITU-T G.8272/Y.1367 (2015), *Timing characteristics of primary reference time clocks*.

3 Definitions

Definitions related to synchronization are contained in [ITU-T G.810] and [ITU-T G.8260].

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4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ePRTC	Enhanced Primary Reference Time Clock
FM	Frequency Modulation
GNSS	Global Navigation Satellite System
MTIE	Maximum Time Interval Error
NE	Network Equipment
PPS	Pulse Per Second
PRC	Primary Reference Clock
PRTC	Primary Reference Time Clock
PTP	Precision Time Protocol
SSU	Synchronization Supply Unit
T-GM	Telecom Grand Master
TDEV	Time Deviation
UTC	Coordinated Universal Time

5 Conventions

None.

6 Time error, wander and jitter in locked mode

The noise generation of an ePRTC is characterized by two main aspects:

1) the constant time error (time offset) at its output compared to the applicable primary time standard (e.g., UTC);

2) the amount of phase error (wander and jitter) produced at its output.

For characterization of the second aspect described above (phase error) the calculation of the maximum time interval error (MTIE) and the time deviation (TDEV) is useful.

Clause 6.1 defines the time error requirements applicable at the output of the ePRTC, which correspond to the combination of the two aspects described above (constant time error and phase error). No requirement is defined for the constant time error component taken alone, only when it is combined with the phase error.

Clauses 6.2 and 6.3 define the wander and jitter requirements applicable at the output of the ePRTC, which correspond to the second aspect described above (phase error).

The performance of the output of the combined ePRTC and T-GM function is for further study.

6.1 Time error in locked mode

Under normal, locked operating conditions, the time output of the ePRTC should be accurate to within 30 ns or better when verified against the applicable primary time standard (e.g., UTC). For the ePRTC this value includes all the noise components, i.e., the constant time error (time offset) and the phase error (wander and jitter) of the ePRTC. The combined ePRTC and T-GM function is for further study.

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