International Telecommunication Union

ITU-T G.8275/Y.1369

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Amendment 2

(04/2016)

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Packet over Transport aspects – Synchronization, quality and availability targets

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

Architecture and requirements for packet-based time and phase distribution

Amendment 2

Recommendation ITU-T G.8275/Y.1369 (2013) – Amendment 2

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Recommendation ITU-T G.8275/Y.1369

Architecture and requirements for packet-based time and phase distribution

Amendment 2

Summary

Amendment 2 to Recommendation ITU-T G.8275/Y.1369 (2013) adds support for precision time protocol (PTP) transparent clocks (TCs) to the architecture and adds an informative appendix on alternate best master clock algorithm (BMCA) operation in ring topologies.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T G.8275/Y.1369	2013-11-22	15	11.1002/1000/12011
1.1	ITU-T G.8275/Y.1369 (2013) Amd. 1	2015-01-13	15	11.1002/1000/12396
1.2	ITU-T G.8275/Y.1369 (2013) Amd. 2	2016-04-13	15	11.1002/1000/12814

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

Recommendation ITU-T G.8275/Y.1369

Architecture and requirements for packet-based time and phase distribution

1) Clause 4, Abbreviations and acronyms

In clause 2, add the following acronym in alphabetical order:

HRM Hypothetical Reference Model

2) Clause 7.1, Packet-based time and phase distribution

2.1) Fifth paragraph of clause 7.1

*Modify the fifth paragraph of **c**lause 7.1 as follows*:

The current version of this Recommendation describes an architecture for this case (full timing support to the protocol level), where ~~all~~ the intermediate nodes are telecom transparent clocks (T-TCs) or telecom boundary clocks (T-BCs) with physical layer frequency support. ~~Transparent clocks are being studied and may be included in future versions of this Recommendation.~~

2.2) Eighth paragraph of clause 7.1

*Modify **c**lause 7.1 starting at paragraph 8 as follows*:

The time-transfer protocol operating between the nodes allows the same time to be recovered or corrected at all nodes participating in the timing protocol, subject to some degradation (δ).

In some deployments, especially in the access part of the network, it may be convenient to provide timing support from the protocol via T-TC functions. One typical example is in case of microwave connections.

NOTE – The T-TCs are typically connected in tree architectures. Rings composed entirely of T-TCs can raise issues in terms of PTP packets loops.

The general network topology for time/phase distribution from a packet master clock PRTC to a telecom time slave clock (T-TSC) is shown in Figure 1. The synchronization flow is from the master to slave, although the timing messages will flow in both directions. Individual nodes are ~~telecom boundary clocks (~~T-BC~~s)~~ or ~~telecom transparent clocks (~~T-~~-TCs)~~ in the case of full support from the network.

NOTE – The following figure does not imply any hypothetical reference model (HRM).

2.3) Figure 1

Replace Figure 1 with the following figure:

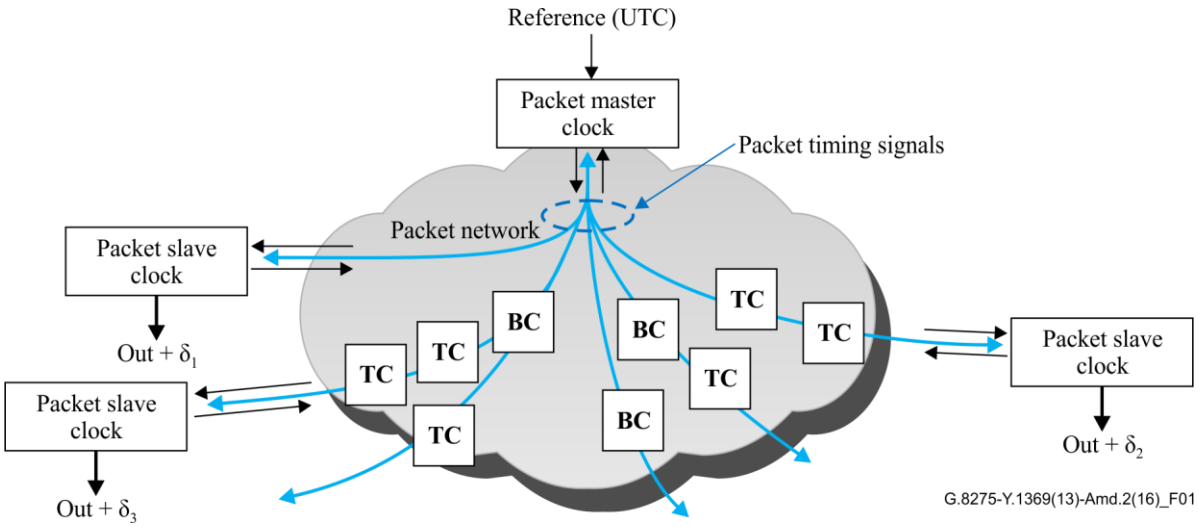

Figure 1 – Time distribution to slave clocks

3) Clause 7.2, Time/phase protection aspects

Add the following note to Figure 6:

NOTE − In addition to being connected to a T-GM, a PRTC may be connected to a T-BC by the 1pps+ToD interface. This is useful for some applications such as achieving protection in ring network, see Appendix II.

Add the following note to Figure 7:

NOTE − In addition to being connected to a T-GM, a PRTC may be connected to a T-BC by the 1pps+ToD interface. This is useful for some applications such as achieving protection in ring network, see Appendix II.

4) New Appendix II

Add the following as new Appendix II:

Appendix II

An example of PRTC switching by the BMCA in a ring network

(This appendix does not form an integral part of this Recommendation.)

Figure II.1 and Figure II.2 in the following show the application scenario. In the figures, the working PRTC has higher priority than the back-up PRTC.

Normally, the working PRTC (i.e., PRTC-1) sends frequency via a 2048 kHz or 2048 kbit/s signal and phase/time via a 1PPS + ToD signal to the T-BC that it is connected to. This T-BC is the GM, and all the network elements including the T-BC connected to the back-up PRTC (i.e., PRTC-2) track the phase/time of the working PRTC, as shown in Figure II.1.

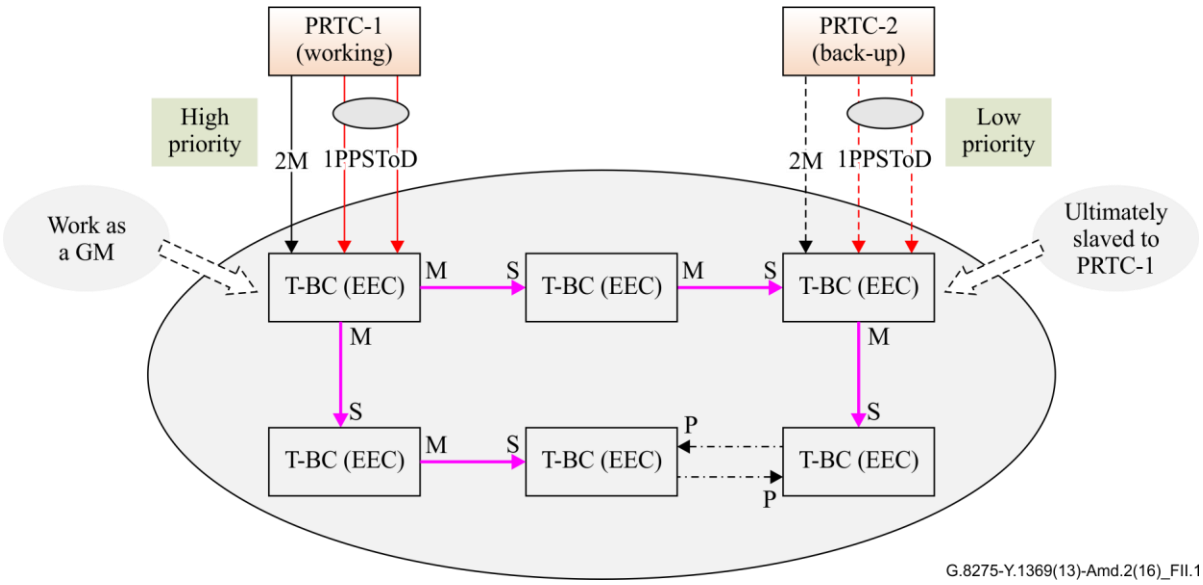

Figure II.1 − Normal state (T-BC connected to working PRTC is working as a GM)

If, at some time, PRTC-1 is degraded (e.g., the GNSS signal is lost), or the connection between PRTC-1 and the T-BC it is connected to fails, PRTC-2 becomes the working PRTC. All the network elements will then track the phase/time of PRTC-2, and the T-BC initially connected to PRTC-1 will no longer be the GM, as shown in Figure II.2.

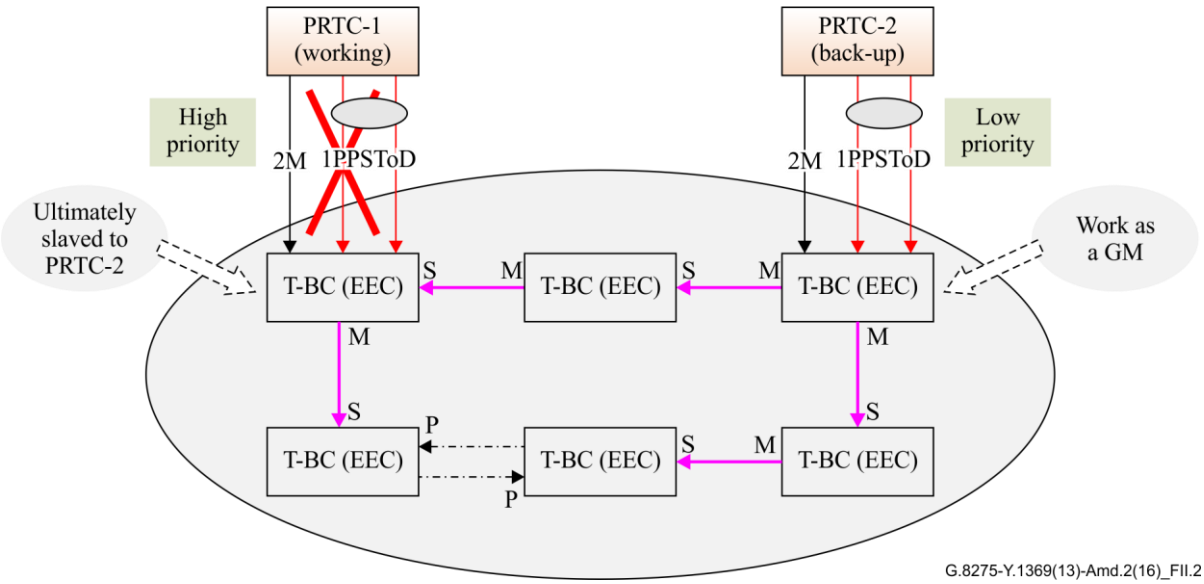

Figure II.2 – Abnormal state (the working PRTC has failed)

The above operation can be obtained using the BMCA by setting the clockClass of PRTC-1 and PRTC-2 to 6 when they are operating normally (i.e., when they are traceable to a GNSS) and setting priority2 for PRTC-1 to be better (i.e., to have a smaller value) than priority2 for PRTC-1. Both PRTC-1 and PRTC-2 are attached to the respective T-BCs via virtual PTP ports (see [b-ITU-T G.8275.1]), and the respective PTP attributes, which include clockClass and priority2 are transferred via the 1PPS+ToD interfaces to the virtual PTP ports (see [ITU-T G.8271]). With these values for clockClass and priority2 (and with clockAccuracy and offsetScaledLogVariance of PRTC-1 and PRTC-2 the same) PRTC-1 will win the BMCA when it is operating normally because its clockClass will be the same or better than the clockClass of PRTC-2 and its priority2 will be better than the priority2 of PRTC-2. If PRTC-1 degrades, its clockClass will be worse than that of PRTC-2

and PRTC-2 will win the BMCA. If PRTC-1 is lost (i.e., the connection from PRTC-1 to the T-BC it is attached to is cut), there will be no input to the virtual PTP port and PRTC-2 will win the BMCA.

5 Bibliography

Add the following as a new entry to the bibliography in the appropriate order:

[b-ITU-T G.8275.1] Recommendation ITU-T G.8275.1/Y.1369.1 (2016), *Precision time protocol telecom profile for phase/time synchronization with full timing support from the network.*

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Printed in Switzerland
Geneva, 2016