Title: Liaison response to work items related to deterministic communication in ITU-T SG13
From: IEEE 802.1 Working Group
For: Action
Contacts: Glenn Parsons, Chair, IEEE 802.1, glenn.parsons@ericsson.com
Jessy Rouyer, Vice-Chair, IEEE 802.1, jessy.rouyer@nokia.com
János Farkas, Chair, IEEE 802.1 TSN Task Group, janos.farkas@ericsson.com
Ludwig Winkel, Chair, IEC/IEEE 60802 Joint Project, ludwig.winkel@online.de
Paul Nikolich, Chair, IEEE 802, p.nikolich@ieee.org
Karen Randall, Liaison Secretary, IEEE 802.1, karen@randall-consulting.com
Jodi Haasz, Senior Manager, IEEE SA Operational Program Management, j.haasz@ieee.org
To: ITU-T Study Group 13, tsbsg13@itu.int
Taesang Choi, Q6/13 Rapporteur, choits@etri.re.kr
Guosheng Zhu, Q6/13 Associate Rapporteur, zhuguosheng@hubu.edu.cn
Scott Mansfield, JCA IMT-2020 Chairman, scott.mansfield@ericsson.com
Cc: ITU-T Study Group 12, tsbsg12@itu.int
IETF DetNet WG, detnet@ietf.org
Lou Berger, Co-Chair, IETF DetNet Working Group, lberger@labn.net
János Farkas, Co-Chair, IETF DetNet Working Group, janos.farkas@ericsson.com
John Scudder, Area Director, IETF Routing Area, jgs@juniper.net
Alvaro Retana, Area Director, IETF Routing Area, aretana.ietf@gmail.com
Martin Vigoureux, Area Director, IETF Routing Area, martin.vigoureux@nokia.com
3GPP SA Working Group 2 (SA2)
Puneet Jain, Chairman, puneet.jain@intel.com
Andy Bennett, Vice Chairman, a.bennett@samsung.com
Tao Sun, Vice Chairman, suntao@chinamobile.com
Maurice Pope, Secretary, maurice.pope@etsi.org
3GPP Liaisons Coordinator, 3GPPLiaison@etsi.org
IEC TC65, IEC SC65C
Ian Verhappen, Chair, IEC SC65C, ian.verhappen@willowglensystems.com
Valérie Demassieux, Secretary, IEC SC65C, vdemassieux@ra.rockwell.com
Ludwig Winkel, Convenor, IEC SC65C/WG18, ludwig.winkel@online.de
Rudy Belliardi, Assistant secretary, IEC TC65, rudy.belliardi@schneider-electric.com
Marianna Kramarikova, IEC Technical Officer, mkr@iec.ch
SAE International
Stefano Lassini, Chair, SAE International AS-1, Stefano.Lassini@ge.com
Dorothy Lloyd, Aerospace Committee Manager, SAE International, Dorothy.Lloyd@sae.org
Date: Nov 16, 2021

Dear Colleagues,

The IEEE 802.1 Working Group would like to thank ITU-T Study Group 13 for the information provided in liaison statement SG13-LS217 about work items related to deterministic communication in ITU-T SG13.

From an organizational perspective, there are three coordinated standardization initiatives for deterministic communication:

- IEEE: Time-Sensitive Networking (TSN)
- IETF: Deterministic Networking (DetNet)
- 3GPP: SA Working Group 2

As part of IEEE 802, the IEEE 802.1 TSN Task Group (TSN TG) is focused on TSN scoped to Local/Metropolitan Area Networks. For application areas that require deterministic communication in a Local/Metropolitan Area Network, a TSN profile standard is standardized. Examples of ongoing TSN profile projects include:

- IEC/IEEE 60802: TSN Profile for Industrial Automation
- IEEE P802.1DG: TSN Profile for Automotive In-Vehicle Ethernet Communications
- IEEE P802.1DP / SAE AS 6675: TSN for Aerospace Onboard Ethernet Communications

With each application profile, the TSN TG coordinates with the leading standardization organization for that application (e.g., IEC for industrial automation, SAE International for aerospace). This helps to meet the needs of that application profile in a Local/Metropolitan Area Network.

Many of these applications have needs beyond a Local/Metropolitan Area Network, including the Internet and 5G/6G networks. The TSN TG uses its coordination with IETF and 3GPP to help meet those needs as well. The overall goal is to provide coordination among standardization initiatives for deterministic communication.

The work items related to deterministic communication in ITU-T SG13 appear to be proposed independently of this coordination. The risk of such independence is that ITU-T SG13 could miss out on much of the coordination with the applications that ITU-T SG13 work items aim to target (such as smart industry).

The IEEE 802.1 Working Group also looks forward to continued collaboration with ITU-T SG13. In that spirit, please find in Annex our technical considerations related to the documents attached to your liaison statement. Additionally, in the context of deterministic communication, we invite ITU-T SG13 to work as an integrated part of the coordination described above. We are happy to develop our TSN technology further to address needs and requirements as they arise. We welcome you and any interested parties to join, contribute, and work together towards addressing market needs.

Note that the IEEE 802 work is open and contribution driven. Participation is on an individual basis and technical discussion can be conducted based on individual contributions. The TSN Task Group holds regular electronic meetings: details are available at https://1.ieee802.org/wg-calendar.

Respectfully submitted,
Glenn Parsons
Chair, IEEE 802.1 Working Group

Annex: Technical Considerations

Within this Annex, "TSN" refers only to the standards for deterministic communication within IEEE 802.1.

TSN meets its design goals for Local/Metropolitan Area Networks, which include providing both upper and lower bounds on packet delay and packet delay variation (jitter), low packet loss, and high availability/reliability.

Clause 3.2.4 of ITU-T Y.3113 (and clauses 3.2.3 of draft ITU-T Y.IMT2020-fa-lg-lsn and 3.2.1 of draft ITU-T Y.IMT2020-jg-lsn) defines ‘large scale network’ as “A network or a set of networks, whose longest end-to-end path includes 16 or more relay nodes”; however, ITU-T Y.3113 describes TSN as unsuitable for a large scale network. Draft 1.3 of IEC/IEEE 60802 specifies 64 as the minimum hop requirement to be supported and some networks go beyond 64 hops: for example, to 100 hops and up. This suggests that TSN is suitable for a large scale network.

Furthermore, ITU-T Y.3113 assumes that TSN is a single-domain technology. We would like to point out that our IEEE P802.1Qdj project specifies ‘TSN Domain’ in support of various deployments (such as industrial automation) intending to comprise multiple TSN domains. This allows forming a multi-domain network where the TSN domains work together as a whole.

We have noticed the focus on gateways in draft ITU-T Y.det-qos-reqts-lan. For example, its Figure 1 illustrates a gateway supporting a deterministic communication service across multiple domains, including across multiple TSN domains. TSN is specified to avoid the need for any gateway between two TSN domains. Converged networks is a key target in various application areas, including smart manufacturing. Industrial players aim to eliminate gateways as they complicate network convergence. Additionally, IEEE 802.1 TSN and IEEE 802.11 are IEEE 802 technologies specified under the common IEEE 802 architecture to avoid the need for any gateway. As we learned from 3GPP LS S2-1908630 and 5G-ACIA-LS-2021-001, the 5G System is integrated transparently as a logical bridge in a TSN domain; therefore, there is no need for any gateway in the case of 5G either.

Draft ITU-T Y.IMT2020-jg-lsn states that TSN “solutions rely on time-synchronization and slot scheduling at every node in the network”. This is incomplete. TSN includes further solutions and provides solution flexibility depending on the application use case. For example, neither the Credit-Based Shaper nor the Asynchronous Traffic Shaper require time synchronization. Strict priority scheduling can be also applied in certain deployments.

We noticed that the solution described in draft ITU-T Y.IMT2020-jg-lsn relies on timestamping each packet of a data stream. We would like to draw your attention to the complexity of accurate timestamping: see for example the IEEE P802.3cx project. Please also note the difference in complexity in timestamping PTP PDUs (PTP being a slow protocol) versus timestamping each packet of a data stream at line rate.