

**IEEE 802 Liaison Statement to ISO/IEC JTC1/SC6 in Response to the Request for IEEE 802 comments on the Preliminary Work Item (PWI) for a Deterministic Wireless Industrial Network project**

**TO:**

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**CC:**

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**SUBJECT: IEEE 802 Liaison Statement in Response to the Request for comments on the Preliminary Work Item (PWI) for a Deterministic Wireless Industrial Network project**

**DATE: 2022-01-28**

Dear Mr. Jungyup OH,

The attachment below contains the IEEE 802 approved response to the request for IEEE 802 comments on the PWI for a Deterministic Wireless Industrial Network project.

Thank you for providing IEEE 802 with the opportunity to submit comments.  
Please contact me with any questions.

Yours sincerely,

/s/

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Chair, IEEE 802 LAN/MAN Standards Committee  
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**ATTACHMENT 1:** Liaison statement containing the IEEE 802 response to the request for comments on the PWI for a Deterministic Wireless Industrial Network project

## **IEEE 802 is providing comments on the PWI proposal for a Deterministic Wireless Industrial Network project<sup>1</sup>**

At the ISO/IEC JTC1/SC6/WG1 meeting in August/September 2021, the N17531 [6] submission proposed a *Deterministic Wireless Industrial Network* project. Subsequently, a request from WG1 (see WG1 N299) was made for comments from National Bodies and other SDOs to be submitted to ISO/IEC JTC1/SC6/WG1 for consideration at its interim meeting in February 2022. This Liaison Statement contains the IEEE 802 response to that request.

### **Industrial networks are evolving to use Time-Sensitive Networking (TSN) over standards based, widely available networks**

Industrial networks are evolving from being based on proprietary protocols to using standards-based networks, leveraging widely available connectivity protocols. In particular, they are often converging on IEEE 802 LAN and TSN standards to deliver time synchronization and bounded latency with determinism. The industry ecosystem for TSN is rapidly developing based on various IEEE 802.1, IEEE 802.3 (Ethernet), IEEE 802.11 (Wi-Fi) and 3GPP (5G) standards. An overview of wireline and wireless TSN extensions can be found in [1].

TSN over widely available connectivity protocols and networks is also supported by a variety of other organisations. For example, the IEC/IEEE 60802 Joint Project is standardizing a TSN Profile for Industrial Automation [2]. Certification for TSN-capable wired and wireless networks is being developed in IEC 61802 and as part of the Avnu Alliance [3]. Trials using Wi-Fi 6 and TSN for Industrial IOT application are underway in the Wireless Broadband Alliance (WBA) IOT Work Group [4].

Industrial networks serve a wide range of applications with heterogeneous requirements. Time-synchronized isochronous traffic is one of the key applications. The benefits of wireless networks are obvious in many applications requiring mobility and flexibility. As can be seen by the activities across several industry forums, considerable efforts are currently underway to address the requirements of time-sensitive applications in converged and standard-based wired and wireless networks. A wide range of wireless use cases and their requirements are available, as specified by several industry forums [3] [4] [5].

### **The IEEE 802.3 and IEEE 802.11 standards continue to be refined to meet industrial network requirements for TSN**

The IEEE 802.3 WG and the IEEE 802.11 WG have been collaborating for many years with the IEEE 802.1 TSN Task Group. Several TSN features are applicable for both 802.3 and 802.11 based network use. For example, time distribution and synchronization based on IEEE Std 802.1AS<sup>TM</sup>-2020 has been standardized over both 802.3 and 802.11 networks, with support for 802.11 enabled by Timing Measurement (TM) and Fine Timing Measurement (FTM). Recent enhancements in the IEEE Std 802.11ax<sup>TM</sup>-2021 standard enable multi-user scheduling, combined with TSN traffic scheduling (originally specified as IEEE 802.1Qbv and now part of IEEE Std 802.1Q<sup>TM</sup>-2018), which can enhance determinism and support low bounded latency with high confidence.

Given the convergence toward TSN, as acknowledged in the ISO/IEC JTC 1/SC 6 proposal [6], and industry efforts on extending TSN over 802.3 and 802.11 networks, there is a clear path to address the practical needs of today's and future industrial networks enabling integration of IT (Information Technology) and OT (Operational Technology). Although 802.3 and 802.11 technologies can already address various use cases, it is expected that these connectivity technologies, especially 802.11 capabilities, will continue to evolve to support use cases demanding lower latencies, higher reliability, and higher efficiency. Industry efforts continue to enable new capabilities in next-generation IEEE 802.11 standards. For instance, the IEEE P802.11be project is introducing enhancements to better support TSN scheduling. It is also expected that ultra-low latency and determinism will continue to be key requirements for future IEEE 802.11 generations beyond IEEE P802.11be.

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<sup>1</sup> This document solely represents the views of the IEEE 802 LMSC, and does not necessarily represent a position of the IEEE or the IEEE Standards Association.

## IEEE 802 requests that ISO/IEC JTC1/SC6 WG1 assist in developing 802.3 and 802.11 refinements

IEEE 802 believe the ongoing refinement of the IEEE 802.11 and IEEE 802.3 standards to support the needs of industrial networks, in parallel to the TSN work in the IEEE 802.1 WG, will best enable the transformation of industrial networks towards IT/OT convergence. This approach will meet the needs of industrial networks into the future and is more likely to succeed in the marketplace because it does not require the deployment of completely new networks. Given the wide range of applications and requirements, many opportunities exist for collaboration across standards organizations and forums to understand the challenges and gaps in existing Wi-Fi and Ethernet connectivity capabilities in order to address the needs of future industrial networks.

IEEE 802 invites ISO/IEC JTC1/SC6/WG1 to provide a Liaison Statement to IEEE 802 that highlights its perspective on how the IEEE 802.3 and IEEE 802.11 standards can be improved to better meet industrial networking needs. We hope that this would then become the basis of ongoing collaboration.

## References

- [1] D. Cavalcanti et al, "Extending Accurate Time Distribution and Timeliness Capabilities over the Air to Enable Future Wireless Industrial Automation Systems," accepted for publication in the Proceedings of the IEEE, March 2019:  
[https://www.researchgate.net/publication/331942593\\_Extending\\_Accurate\\_Time\\_Distribution\\_and\\_Timeliness\\_Capabilities\\_Over\\_the\\_Air\\_to\\_Enable\\_Future\\_Wireless\\_Industrial\\_Automation\\_Systems](https://www.researchgate.net/publication/331942593_Extending_Accurate_Time_Distribution_and_Timeliness_Capabilities_Over_the_Air_to_Enable_Future_Wireless_Industrial_Automation_Systems)
- [2] <https://1.ieee802.org/tsn/iec-ieee-60802/>
- [3] Avnu Alliance Wireless TSN working group: <https://avnu.org/wirelessTSN/>
- [4] Wireless Broadband Alliance: <https://wballiance.com/resources/wba-white-papers/>
- [5] IEEE 802.11 Real-Time Applications (RTA) Topic Interest Group Report Summary and Recommendations, <https://mentor.ieee.org/802.11/dcn/19/11-19-0065-06-0rta-rta-tig-summary-and-recommendations.pptx>
- [6] ISO/IEC JTC 1/SC 6 N17531 "PWI Proposal on Deterministic Wireless Industrial Network"