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IEEE/SAE Standard for Local and Metropolitan Area Networks—

Time-Sensitive Networking for Aerospace Onboard Ethernet Communications

IEEE Computer Society

Developed by the
LAN/MAN Standards Committee

IEEE Std 802.1DP™-2025
SAE AS6675-2025

TSN Time Sensitive Networking Powered by IEEE 802 Aerospace Ethernet

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IEEE/SAE Standard for Local and Metropolitan Area Networks—

Time-Sensitive Networking for Aerospace Onboard Ethernet Communications

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LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 10 September 2025

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Abstract: Profiles of IEEE 802.1 Time-Sensitive Networking (TSN) for aerospace onboard bridged IEEE 802.3 Ethernet networks are specified in this standard. The profiles select features, options, configurations, defaults, protocols, and procedures of bridges, end stations, and Local Area Networks to build deterministic networks for aerospace onboard communications.

Keywords: Bridged Network, IEEE 802.1DP, IEEE 802.1Q™, LAN, local area network, MAC security, MACsec, privacy, SAE AS6675, Virtual Bridged Network, virtual LAN, VLAN Bridge

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This introduction is not part of IEEE Std 802.1DP-2025/SAE AS6675, IEEE/SAE Standard for Local and Metropolitan Area Networks—Time-Sensitive Networking for Aerospace Onboard Ethernet Communications.

This standard specifies profiles of IEEE 802.1 Time-Sensitive Networking (TSN) and IEEE 802.1 Security standards for aerospace onboard bridged IEEE 802.3 Ethernet networks.

This standard was first published as IEEE Std 802.1DP-2025/SAE AS6675.

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1. Overview

The standardization of Ethernet communication technology in IEEE Std 802.3™, specifying transmission over the physical media of individual Local Area Networks (LANs), and in IEEE Std 802.1Q™, specifying Bridges that interconnect IEEE 802® LANs,[6] has facilitated widespread deployment of networks that connect significantly more end stations, with significantly greater bandwidth, and at significantly reduced cost compared to prior technology. All these metrics have been improved by several orders of magnitude—reducing costs through the multi-vendor provision of common components (bridges, end station interfaces, integrated circuit and circuit designs, connectors, and software) for a wide range of network applications.

The use of Ethernet communication technology in networks with high-reliability and deterministic latency requirements is further supported by Time-Sensitive Networking (TSN) provisions in IEEE Std 802.1Q, IEEE Std 802.1AS, IEEE Std 802.1CB, and the security provisions in IEEE Std 802.1AE and IEEE Std 802.1X. The provisions in these standards can be used in various ways, and include options that address different network requirements and parameters that vary by network and application scale. Network design, time to deploy, component development, component selection, component validation, and component configuration for a particular network can all benefit from consistent choices across similar networks and network applications of the provisions, parameters, and options specified in the relevant standards. A set of such choices comprises a *profile* of those standards and target networks.

This standard specifies profiles for use in Ethernet networks supporting aerospace onboard communications. These networks and their network components have stringent verification requirements, so the profiles emphasize not just what capabilities are to be available, but also what optional capabilities are not used. All available capabilities can be subject to time-consuming and expensive verification, so omission of unused capabilities is desirable and can be required.

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1.1 Scope

This standard specifies profiles of IEEE 802.1 Time-Sensitive Networking (TSN) and IEEE 802.1 Security standards for aerospace onboard bridged IEEE 802.3 Ethernet networks. The profiles select features, options, configurations, defaults, protocols, and procedures of bridges, end stations, and Local Area Networks to build deterministic networks for aerospace onboard communications.

1.2 Purpose

This standard specifies profiles for designers, implementers, integrators, and certification agencies of deterministic IEEE 802.3 Ethernet networks that support a broad range of aerospace onboard applications including those requiring security, high availability and reliability, maintainability, and bounded latency.

1.3 Introduction

The TSN suite of standards are broad ranging, and intended for use in a variety of environments that require bounded latency, synchronization, reliability, isolation, and high availability. This standard selects the TSN features that are directly applicable to Aerospace Onboard Ethernet Communications and explains how the associated TSN standards are used. This standard narrows the focus from the broad set of available TSN features to those that are applicable to aerospace onboard networks.

The standard describes use cases and functional requirements pertinent to the use of TSN in aerospace platforms. The conformance clause, Clause 5, specifies mandatory and optional features that are expected to be provided by conformant implementations of systems, system components, and system functions used in aerospace onboard Ethernet networks.

Consistent with the purpose of this standard, Aerospace OEMs and suppliers at all tiers are able to use this standard to specify and design the network and network components required to implement the systems and functions on aerospace platforms. Component and technology suppliers are expected to benefit by understanding which TSN features are required to allow OEMs and higher-tier suppliers to implement conformant aerospace onboard networks.

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IEEE Std 802.1AS™-2020, IEEE Standard for Local and Metropolitan Area Networks—Timing and Synchronization for Time-Sensitive Applications.[7, 8]

IEEE Std 802.1ASdm™-2024, IEEE Standard for Local and Metropolitan Area Networks—Timing and Synchronization for Time-Sensitive Applications—Amendment 3: Hot Standby and Clock Drift Error Reduction.

IEEE Std 802.1ASdn™-2024, IEEE Standard for Local and Metropolitan Area Networks—Timing and Synchronization for Time-Sensitive Applications—Amendment 2: YANG Data Model.

IEEE Std 802.1ASdr™-2024, IEEE Standard for Local and Metropolitan Area Networks—Timing and Synchronization for Time-Sensitive Applications—Amendment 1: Inclusive Terminology.

IEEE P802.1ASed Draft 3.2, IEEE Draft Standard for Local and Metropolitan Area Networks—Timing and Synchronization for Time-Sensitive Applications—Amendment: Fault Tolerant Timing with Time Integrity, October 2025.[9]

IEEE Std 802.1CB™-2017, IEEE Standard for Local and Metropolitan Area Networks—Frame Replication and Elimination for Reliability.

IEEE Std 802.1CBcv™-2021, IEEE Standard for Local and Metropolitan Area Networks—Frame Replication and Elimination for Reliability—Amendment 1: Information Model, YANG Data Model and Management Information Base Module.

IEEE Std 802.1CBdb™-2021, IEEE Standard for Local and Metropolitan Area Networks—Frame Replication and Elimination for Reliability—Amendment 2: Extended Stream Identification Functions.

IEEE Std 802.1DC™-2024, IEEE Standard for Local and Metropolitan Area Networks—Quality of Service Provision by Network Systems.

IEEE Std 802.1Q™-2022, IEEE Standard for Local aNd Metropolitan Area Networks—Bridges and Bridged Networks.

IEEE Std 802.1Qcw™-2023, IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Amendment 36: YANG Data Models for Scheduled Traffic, Frame Preemption, and Per-Stream Filtering and Policing.

IEEE Std 802.1Qdj™-2024, IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Amendment 38: Configuration Enhancements for Time-Sensitive Networking.

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IEEE Std 802.1Qdx™-2024, IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Amendment 39: YANG Data Models for the Credit-Based Shaper.

IEEE Std 1588e™-2024, IEEE Standard for Precision Clock Synchronization Protocol for Networked Measurement and Control Systems—Amendment 5: MIB and YANG Modules.

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3. Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.[10]

This standard makes use of the following terms defined in IEEE Std 802® [B5].[11]

— end station
— frame

This standard makes use of the following terms defined in IEEE Std 802.1Q.

— Centralized Network Configuration (CNC)
— Centralized User Configuration (CUC)
— Bridge
— packet
— policing
— Stream
— Tagged frame
— Talker

The following terms are specific to this standard:

aerospace end system: A system attached to a network onboard an aerospace platform that is an initial source or a final destination of data transmitted across that network.

NOTE—The term "aerospace end system" is used in this document to refer to aerospace systems that encompass all layers of Open Systems Interconnection (OSI) reference basic model, ISO/IEC 7498-1:1994 [B7].[12]

Bridged end station: A system with both end station and Bridge components.

end station: A functional unit in an IEEE 802® network that acts as a source of, and/or destination for, link layer data traffic carried on the network (IEEE Std 802-2014).

onboard: A system, or a set of systems, that is permanently installed onboard an aerospace platform. This does not include test or instrumentation systems installed on the ground to support platform operation.

time-aware: An adjective to describe use of time that is synchronized with other stations using a protocol (e.g., IEEE Std 802.1AS).

traffic: A sequence of frames forwarded in a network.

[10] *IEEE Standards Dictionary Online* is available at https://dictionary.ieee.org.
[11] The numbers in brackets correspond to those of the bibliography in Annex C.
[12] Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

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