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Introduction

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For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



65C/949/CD

COMMITTEE DRAFT (CD)

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65C/875/NP,65C/896/RVN

IEC SC 65C : INDUSTRIAL NETWORKS

SECRETARIAT:

France

SECRETARY:

Ms Valérie DEMASSIEUX

OF INTEREST TO THE FOLLOWING COMMITTEES:

TC 57

PROPOSED HORIZONTAL STANDARD:

☐

Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☐ SAFETY

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Time-sensitive networking profile for industrial automation

NOTE FROM TC/SC OFFICERS:

This first CD of the joint IEC/IEEE 60802 project is circulated in parallel with the first IEEE 802.1 TG ballot, scheduled from January 25th to February 22nd, 2019. Comments resolution on the IEEE ballot will be done during the next PT 60802 meeting on March 13th-15th, 2019 in Vancouver, remaining complementary comments on the IEC CD will be addressed via follow up web meetings or at the PT 60802 meeting on May 22nd-24th, 2019 in Salt Lake City, UT, USA.

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IEC/IEEE 60802 - Time-Sensitive Networking Profile for Industrial Automation

FOREWORD

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International Standard IEC/IEEE 60802 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation, in cooperation with IEEE 802.1: Higher Layer LAN Protocols Working Group of IEEE 802: LAN/MAN Standards Committee of the IEEE computer society¹, under the IEC/IEEE Dual Logo Agreement.

It is published as an IEC/IEEE dual logo standard.

The text of this standard is based on the following IEC documents:

FDIS	Report on voting
65C/XX/FDIS	65C/XX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

International standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The IEC Technical Committee and IEEE Technical Committee have decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The National Committees are requested to note that for this document the stability date is 2024.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

¹ A list of IEEE participants can be found at the following URL: (to be provided prior to publication).

INTRODUCTION

Editor's Note: This profile has been drafted per the IEC style guide. For the convenience of the reviewer, references to the IEC organization and style guidelines are listed below:

IEC organization:

<http://www.iec.ch/>

Home of the IEC organization of JWG TSN: IEC 65C/MT9:

http://www.iec.ch/dyn/www/f?p=103:7:0:::FSP_ORG_ID,FSP_LANG_ID:1376,25

Assistance to experts drafting IEC documents:

<http://www.iec.ch/standardsdev/resources/draftingpublications/>

Reference material:

http://www.iec.ch/members_experts/refdocs/

ISO/IEC Directives, Part 2:2016

edition 7.0 (2016-05)

Principles and rules for the structure and drafting of ISO and IEC documents:

http://www.iec.ch/members_experts/refdocs/iec/isoiecdir-2%7Bed7.0%7Den.pdf

ISO/IEC Directives, IEC Supplement: 2017

edition 11.0 (2017-05) contains the redline version

Procedures specific to IEC:

http://www.iec.ch/members_experts/refdocs/iec/isoiecdir-iecsp%7Bed11.0%7Den.pdf

This document provides profiles for network infrastructure components (bridges) for Time Sensitive Networking (TSN) according to standards published by IEEE 802.3 and IEEE 802.1 applicable for the industrial automation domain.

NOTE There doesn't exist a standard IEEE 802.1. IEEE 802.1 is used in this document as a placeholder for the various standards of the committee IEEE 802.1.

These profiles meet the industrial automation market objective of converging RTE networks and office networks by defining a common, standardized network infrastructure, taking advantage of the improvements of Ethernet networks in terms of deterministic transmission bandwidth and network span.

These profiles help to avoid the spreading of divergent implementations of deterministic RTE communication networks by using only references to IEEE 802.3 and IEEE 802.1 to build the lower communication stack layers and management. Furthermore these profiles support the coexistence of different data streams between end devices, including Communication Profile Families (CPF) as defined in IEC 61784-2, each with different performance characteristics and functional capabilities, matching the diverse application requirements.

With this approach, adoption of Ethernet technology does not cause the loss of features required in the field area for industrial communication automation networks, such as:

- synchronized actions between field devices like drives,
- efficient, frequent exchange of very small data records and
- reliable and available.

Time-sensitive networking profile for industrial automation

1 Scope

This standard defines time-sensitive networking profiles for industrial automation. The profiles select features, options, configurations, defaults, protocols, and procedures of bridges, end stations, and LANs to build industrial automation networks.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Editor Note: The list of normative references will be updated before CDV circulation.

IEEE P802.1AS-Rev/D7.4, June 12, 2017– *IEEE Draft standard for Local and metropolitan area networks – Timing and Synchronization for Time-Sensitive Applications*

IEEE Std 802.1AE™-2006, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Security*

IEEE Std 802.1AEbn™-2011, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Security Amendment 1: Galois Counter Mode—Advanced Encryption Standard—256 (GCM-AES-256) Cipher Suite*

IEEE Std 802.1AEbw™-2013, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Security Amendment 2: Extended Packet Numbering*

IEEE P802.1AEcg/D1.5, October 25, 2016², *IEEE Draft Standard for Local and metropolitan area networks—Media Access Control (MAC) Security Amendment 3: Ethernet Data Encryption devices*

IEEE Std 802.1AR™-2009, *IEEE Standard for Local and metropolitan area networks – Secure Device Identity*

IEEE Std 802.1Q™-2014, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks*, available at <<http://www.ieee.org>>

IEEE P802.1Qcc/ D1.1, September 1, 2016, *IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks Amendment: Stream Reservation Protocol (SRP) Enhancements and Performance Improvements*

IEEE 802.1Qch™-2017, *IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Amendment: Cyclic Queuing and Forwarding*

IEEE 802.1Qci™-2017, *IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Amendment: Per Stream Filtering and Policing*

IEEE 802.1CB™-2017, *IEEE Standard for Local and metropolitan area networks—Frame Replication and Elimination for Reliability*

IEEE P802.1CS/ D0.0, *IEEE Standard for Local and metropolitan area networks—LRP (Registration)*

² To be published.

IEEE P802.1Qcj/D0.1 March 7, 2016, *IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Automatic Attachment to Provider Backbone Bridging (PBB) services*

IEEE P802.1Qcp/ D0.7 December 12, 2016, *IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Amendment: YANG Data Model*

IEEE P 802.1Qcr/D0.2, October 20, 2017, *IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—Amendment: Asynchronous Traffic Shaping*

IEEE Std 802.1X-2010, *IEEE Standard for Local and Metropolitan Area Networks—Port-based Network Access Control*, available at <<http://www.ieee.org>>

IEEE 802.3-2015, *IEEE Standard for Ethernet*, available at <<http://www.ieee.org>>

IEEE Std 802.3bp™-2016, *IEEE Standard for Ethernet - Amendment 4: Physical Layer Specifications and Management Parameters for 1 Gb/s Operation over a Single Twisted-Pair Copper Cable*

IEEE Std 802.3br™-2016, *IEEE Standard for Ethernet - Amendment 5: Specification and Management Parameters for Interspersing Express Traffic*

IEEE Std 802.3bu™-2016, *IEEE Standard for Ethernet – Amendment #: Physical Layer and Management Parameters for Power over Data Lines (PoDL) of Single Balanced Twisted-Pair Ethernet*

IEEE P802.3bv™/D3.3, 12th December 2016^{Error! Bookmark not defined.}, *IEEE Standard for Ethernet Amendment 9: Physical Layer Specifications and Management Parameters for 1000 Mb/s Operation Over Plastic Optical Fiber*

IEEE P802.3cg, *IEEE Standard for Ethernet – Amendment: Physical Layer Specifications and Management Parameters for 10 Mb/s Operation over Single Balanced Twisted-pair Cabling and Associated Power Delivery*

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC 61784-2, IEEE 802, IEEE 802.3, IEEE 802.1Q and IEEE 802.1AS and the following apply.

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 TSN-IA defined Terms

3.1.1

TSN Domain

quantity of commonly managed industrial automation devices

Note 1 to entry: It is an administrative decision to group these devices.

3.2 List of terms and definitions given in IEC 61784-2, IEEE 802, IEEE 802.3, IEEE 802.1Q and IEEE 802.1AS

For ease of understanding the most important terms used within this profile document are listed but not repeated in Table 1.

123

Table 1 – List of terms

Term	Source
Bridge	IEEE Std 802.1Q™-2018
Bridge Port	IEEE Std 802.1Q™-2018
Bridged Network	IEEE Std 802.1Q™-2018
end station	IEEE Std 802
Ethernet	IEEE Std 802.1Q™-2018
Frame	IEEE Std 802.1Q™-2018
Frame relay	IEEE Std 802.1Q™-2018
latency	IEEE Std 802.1Q™-2018
Listener	IEEE Std 802.1Q™-2018
Port	IEEE Std 802.1Q™-2018
preemption	IEEE Std 802.1Q™-2018
station	IEEE Std 802
Stream	IEEE Std 802.1Q™-2018
Talker	IEEE Std 802.1Q™-2018
time-sensitive stream	IEEE Std 802.1Q™-2018
traffic class	IEEE Std 802.1Q™-2018

124

125 **3.3 Abbreviated terms and acronyms**126 **Editor's Note: has to be updated before CDV stage!**

IA Industrial automation

127 **3.4 Conventions**128 **3.4.1 Conventions for (sub)clause selections of referenced documents**

129 (Sub)clause selections of referenced documents are done in tables, as shown in Table 2 and
 130 Table 3. The selected base specifications are indicated just before the selection table(s) or in
 131 the table title. Selections are done at the highest (sub)clause level possible to define the profile
 132 selection unambiguously.

133 **Table 2 – Layout of profile (sub)clause selection tables**

Clause	Header	Presence	Constraints

134

135

Table 3 – Contents of (sub)clause selection tables

Column	Text	Meaning
Clause	<#>	(Sub)clause number of the base specifications
	Next clauses	any following clauses up to the last clause of the base specification
	Next Annexes	any following annexes up to the last annex of the base specification
Header	<text>	(Sub)clause title of the base specifications
Presence	NO	This (sub)clause is not included in the profile
	YES	This (sub)clause is fully (100 %) included in the profile in this case no further detail is given
	—	Presence is defined in the following (sub)clauses
	Partial	Parts of this (sub)clause are included in the profile
	Optional	This (sub)clause may be additionally included in the profile
Constraints	See <#>	Constraints/remarks are defined in the given (sub)clause, table or figure of this profile document
	—	No constraints other than given in the reference document (sub)clause, or not applicable
	<text>	The text defines the constraint directly; for longer text table footnotes or table notes may be used

136

137 If sequences of (sub)clauses match or do not match the profile, then the numbers are
138 concatenated.

139 EXAMPLE Concatenated (sub)clauses

1 – 6	—	YES	—
7 – 11	—	NO	—

140

141 Conventions for different cases in selection tables, which apply for multiple or different device
142 types (end-station, bridge):

- 143 1. Presence column value YES and NO Constraints given: This (sub)clause is fully (100 %)
144 included in the profile for all device types
- 145 2. Presence column value YES and some Constraints given: the constraints can limit the
146 applicability to a device type
- 147 3. Presence column value PARTIAL and general Constraints without device type
148 constraints given: the constraints can limit the applicability to all device types
- 149 4. Presence column value PARTIAL and general Constraints with device type constraints
150 given: the constraints limit the applicability to a device types
- 151 5. Presence column value NO and no Constraints given: This (sub)clause is not included
152 in the profile for all device types
- 153 6. Subclauses, which are dedicated to a specific device type, do not need to repeat the
154 device type applicability in the Constraints column.

155 Table 4 shows an example of a selection table that apply for multiple device types (end-station,
156 bridge). The Clause numbers used in Table 4 corresponds to the list numbers above.