

INTERNATIONAL
STANDARD

ISO/IEC/
IEEE
8802-3

Second edition
2017-03-01

AMENDMENT 10
2019-02

**Information technology —
Telecommunications and information
exchange between systems — Local
and metropolitan area networks —
Specific requirements —**

iTEH Standards
Standard for Ethernet
(<https://standards.iteh.ai>)
AMENDMENT 10: Media access control
parameters, physical layers, and
management parameters for 200 Gb/s
and 400 Gb/s operation

2019
*Technologies de l'information — Télécommunications et échange
d'information entre systèmes — Réseaux locaux et métropolitains —
Prescriptions spécifiques —*

Partie 3: Norme pour Ethernet

*AMENDEMENT 10: Paramètres de commande d'accès aux supports,
couches physiques et paramètres de gestion pour le fonctionnement
en 200 Gb/s et 400 Gb/s*



Reference number
ISO/IEC/IEEE 8802-3:2017/Amd.10:2019(E)



© IEEE 2017

iTeh Standards

(<https://standards.iteh.ai>)

Document Preview

[ISO/IEC/IEEE 8802-3:2017/Amd 10:2019](https://standards.iteh.ai/catalog/standards/iso/ab6cd111-e544-4b35-bb49-967e173caa4e/iso-iec-ieee-8802-3-2017-amd-10-2019)

<https://standards.iteh.ai/catalog/standards/iso/ab6cd111-e544-4b35-bb49-967e173caa4e/iso-iec-ieee-8802-3-2017-amd-10-2019>



COPYRIGHT PROTECTED DOCUMENT

© IEEE 2017

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO or IEEE at the respective address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Institute of Electrical and Electronics Engineers, Inc
3 Park Avenue, New York
NY 10016-5997, USA

Email: stds.ipr@ieee.org
Website: www.ieee.org

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted (see www.iso.org/directives).

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

<https://standards.iteh.ai> ISO/IEC/IEEE 8802-3:2017/Amd.10:2019

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

ISO/IEC/IEEE 8802-3:2017/Amd.10 was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE Std 802.3bs-2017) and drafted in accordance with its editorial rules. It was adopted, under the "fast-track procedure" defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE, by Joint Technical Committee ISO/IEC JTC 1, *Information technology, Subcommittee SC6, Telecommunications and information exchange between systems*.

A list of all parts in the ISO/IEC/IEEE 8802 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

IEEE Std 802.3bs™-2017

(Amendment to

IEEE Std 802.3™-2015

as amended by

IEEE Std 802.3bw™-2015,

IEEE Std 802.3by™-2016,

IEEE Std 802.3bq™-2016,

IEEE Std 802.3bp™-2016,

IEEE Std 802.3br™-2016,

IEEE Std 802.3bn™-2016,

IEEE Std 802.3bz™-2016,

IEEE Std 802.3bu™-2016,

IEEE Std 802.3bv™-2017, and

IEEE Std 802.3-2015/Cor 1-2017)

IEEE Standard for Ethernet

Amendment 10: Media Access Control Parameters, Physical Layers, and Management Parameters for 200 Gb/s and 400 Gb/s Operation

(<https://standards.iteh.ai>)

LAN/MAN Standards Committee

of the

IEEE Computer Society

[ISO/IEC/IEEE 8802-3:2017/Amd 10:2019](https://standards.iteh.ai)

[Approved 6 December 2017](https://standards.iteh.ai/catalog/standards/iso/ab6cd111-e544-4b35-bb49-967e173caa4e/iso-iec-ieee-8802-3-2017-amd-10)

2019

of the

IEEE-SA Standards Board

Abstract: Clause 116 through Clause 124 and Annex 119A through Annex 120E are added by this amendment to IEEE Std 802.3-2015. This amendment includes IEEE 802.3 Media Access Control (MAC) parameters, Physical Layer specifications, and management parameters for the transfer of IEEE 802.3 format frames at 200 Gb/s and 400 Gb/s.

Keywords: 200 Gb/s Ethernet, 200GAUI-4, 200GAUI-8, 200GBASE-DR4, 200GBASE-FR4, 200GBASE-LR4, 200GBASE-R, 200GMII, 200GXS, 400 Gb/s Ethernet, 400GAUI-8, 400GAUI-16, 400GBASE-DR4, 400GBASE-FR8, 400GBASE-LR8, 400GBASE-SR16, 400GBASE-R, 400GMII, 400GXS, EEE, Energy Efficient Ethernet, Ethernet, FEC, forward error correction, IEEE 802.3TM, IEEE 802.3bsTM, MMF, PAM4, Physical Medium Dependent sublayer, PMD, SMF

iTeh Standards

(<https://standards.iteh.ai>)

Document Preview

[ISO/IEC/IEEE 8802-3:2017/Amd.10:2019](https://standards.iteh.ai/catalog/standards/iso/ab6cd111-e544-4b35-bb49-967e173caa4e/iso-iec-ieee-8802-3-2017-amd-10-2019)

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2017 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 12 December 2017. Printed in the United States of America.

IEEE and 802 are registered trademarks in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

PDF: ISBN 978-1-5044-4450-7 STD22871
Print: ISBN 978-1-5044-4451-4 STDPD22871

IEEE prohibits discrimination, harassment and bullying. For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning IEEE Standards Documents.” They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/PR/disclaimers.html>.

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (“IEEE-SA”) Standards Board. IEEE (“the Institute”) develops its standards through a consensus development process, approved by the American National Standards Institute (“ANSI”), which brings together volunteers representing varied viewpoints and interests to achieve the final product. IEEE Standards are documents developed through scientific, academic, and industry-based technical working groups. Volunteers in IEEE working groups are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers and users of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854 USA

[ISO/IEC/IEEE 8802-3:2017/Amd.10:2019](https://standards.ieee.org/standards/iso/ab6cd111-e544-4b35-bb49-967e173caa4e/iso-iec-ieee-8802-3-2017-amd-10-2019)

2019

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate fee, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE Xplore at <http://ieeexplore.ieee.org/> or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

Errata

(<https://standards.iteh.ai>)

Document Preview

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: <http://standards.ieee.org/findstds/errata/index.html>. Users are encouraged to check this URL for errata periodically.

[ISO/IEC/IEEE 8802-3:2017/Amd 10:2019](#)

Patents

2019

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at <http://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Participants

The following individuals were officers and members of the IEEE 802.3 working group at the beginning of the IEEE P802.3bs working group ballot. Individuals may have not voted or may have voted for approval, disapproval, or abstention on this amendment.

David J. Law, IEEE 802.3 Working Group Chair

Adam Healey, IEEE 802.3 Working Group Vice-Chair

Pete Anslow, IEEE 802.3 Working Group Secretary

Steven B. Carlson, IEEE 802.3 Working Group Executive Secretary

Valerie Maguire, IEEE 802.3 Working Group Treasurer

John D'Ambrosia, IEEE P802.3bs 200 Gb/s and 400 Gb/s Ethernet Task Force Chair
Pete Anslow, IEEE P802.3bs 200 Gb/s and 400 Gb/s Ethernet Task Force Editor-in-Chief
Mark Gustlin, IEEE P802.3bs 200 Gb/s and 400 Gb/s Ethernet Task Force Editor
for Clauses 117, 118, 119, Annex 119A
Steve Trowbridge, IEEE P802.3bs 200 Gb/s and 400 Gb/s Ethernet Task Force Editor
for Clause 120, Annex 120A
Peter Stassar, IEEE P802.3bs 200 Gb/s and 400 Gb/s Ethernet Task Force Editor
for Clauses 121, 122, 124
Jonathan King,¹ IEEE P802.3bs 200 Gb/s and 400 Gb/s Ethernet Task Force Editor
for Clause 123
Andre Szczepanek, IEEE P802.3bs 200 Gb/s and 400 Gb/s Ethernet Task Force Editor
for Annexes 120D, 120E

Justin Abbott

David Abramson

Shadi Abughazaleh

Mohammad Ahmed

Eric Baden

Amrik Bains

Thananya Baldwin

Denis Beaudoin

Christian Beia

Michael Bennett

Vipul Bhatt

William Bliss

Brad Booth

Martin Bouda

Ralf-Peter Braun

Theodore Brillhart

Paul Brooks

Alan Brown

Matthew Brown

Chris Bullock

Jairo Bustos Heredia

Adrian Butter

Francesco Caggioni

Anthony Calbone

Clark Carty

Craig Chabot

Geoffrey Chacon Simon

Mandeep Chadha

David Chalupsky

Jacky Chang

Xin Chang

Ahmad Chini

Keng Hua Chuang

Christopher R. Cole

Yair Darshan

Piers Dawe

Fred Dawson

Wael Diab

Eric DiBiaso

John Dillard

Daniel Dillow

Thuyen Dinh

Curtis Donahue

Dan Dove

Mike Dudek

David Dwelley

Frank Effenberger

Hesham Elbakoury

David Estes

John Ewen

Ramin Farjad

Shahar Feldman

James Fife

Alan Flatman

Matthias Fritzsche

Richard Frosch

Andrew Gardner

Claude Gauthier

Ali Ghiasi

Joel Goergen

Volker Goetzfried

Zhigang Gong

Steven Gorshe

Robert Grow

Marek Hajduczenia

Takehiro Hayashi

Yasuo Hidaka

Rita Horner

Bernd Horrmeyer

Victor Hou

Yasuhiro Hyakutake

Hideki Isono

Tom Issenhuth

Kenneth Jackson

Andrew Jimenez

Chad Jones

Peter Jones

Manabu Kagami

Upen Karetli

Keisuke Kawahara

Yasuaki Kawatsu

Michael Kelsen

Scott Kipp

Michael Klempa

¹Not a member of the IEEE 802.3 working group at the beginning of the working group ballot.

Curtis Knittle
 Shigeru Kobayashi
 Daniel Koehler
 Paul Kolesar
 Tom Kolze
 Glen Kramer
 Hans Lackner
 Jeffrey Lapak
 Mark Laubach
 Han Hyub Lee
 David Lewis
 Jon Lewis
 Mike Peng Li
 Jane Lim
 Dekun Liu
 Hai-Feng Liu
 William Lo
 Miklos Lukacs
 Kent Lusted
 Jeffery Maki
 David Malicoat
 Yonatan Malkiman
 Arthur Marris
 Takeo Masuda
 Erdem Matoglu
 Naoki Matsuda
 Mick McCarthy
 Brett McClellan
 Thomas McDermott
 John McDonough
 Larry McMillan
 Richard Mei
 Richard Mellitz
 Bryan Moffitt
 Ardeshir Mohammadian
 Paul Mooney
 Dale Murray
 Henry Muyshondt
 James Nadolny

Edward Nakamoto
 Gary Nicholl
 Kevin Noll
 Mark Nowell
 David Ofelt
 Tom Palkert
 Hui Pan
 Sesha Panguluri
 Vasu Parthasarathy
 Petar Pepeljugoski
 Gerald Pepper
 Ruben Perez De Aranda Alonso
 Michael Peters
 Phong Pham
 Jean Picard
 William Powell
 Rick Rabinovich
 Adee Ran
 Alon Regev
 Duane Remein
 Victor Renteria
 Christopher Roth
 Salvatore Rotolo
 Toshiaki Sakai
 Jorge Salinger
 Sam Sambasivan
 Edward Sayre
 Dieter Schicketanz
 Fred Schindler
 Hossein Sedarat
 Naoshi Serizawa
 Masood Shariff
 Ramin Shirani
 Tom Skaar
 Jeff Slavick
 Daniel Smith
 Scott Sommers
 Yoshiaki Sone
 Tom Souvignier
 Heath Stewart

Robert Stone
 David Stover
 Junqing Sun
 Ken-Ichi Suzuki
 Steve Swanson
 William Szeto
 Bharat Tailor
 Takayuki Tajima
 Satoshi Takahashi
 Kohichi Tamura
 Brian Teipen
 Geoffrey Thompson
 Pirooz Tooyserkani
 Albert Tretter
 Yoshihiro Tsukamoto
 Ed Ulrichs
 Alexander Umnov
 Sterling A. Vaden
 Stefano Valle
 Paul Vanderlaan
 Robert Wagner
 Dylan Walker
 Haifei Wang
 Roy Wang
 Tongtong Wang
 Xinyuan Wang
 Matthias Wendt
 Oded Wertheim
 Natalie Wienckowski
 Ludwig Winkel
 Peter Wu
 Dayin Xu
 Yu Xu
 Jun Yi
 Lennart Yseboodt
 Hayato Yuki
 Andrew Zambell
 Yan Zhuang
 George Zimmerman

The following members of the individual balloting committee voted on this amendment. Balloters may have voted for approval, disapproval, or abstention.

Mohammad Ahmed	Werner Hoelzl	Glenn Parsons
Thomas Alexander	Rita Horner	Bansi Patel
Pete Anslow	Noriyuki Ikeuchi	Arumugam Paventhalan
Butch Anton	Sergiu Iordanescu	Michael Peters
Stefan Aust	Osamu Ishida	David Piehler
Eric Baden	Atsushi Ito	Rick Pimpinella
Saman Behtash	Raj Jain	Adee Ran
Ralf-Peter Braun	SangKwon Jeong	Alon Regev
Nancy Bravin	Piotr Karocki	Maximilian Riegel
Theodore Brillhart	Stuart Kerry	Robert Robinson
Matthew Brown	Yongbum Kim	Toshiaki Sakai
Jairo Bustos Heredia	Jonathan King	Osman Sakr
William Byrd	Paul Kolesar	Dieter Schicketanz
Steven B. Carlson	Mark Laubach	Takeshi Shimizu
Juan Carreon	David J. Law	Kapil Shrikhande
David Chalupsky	June Hee Lee	Jeff Slavick
Boung Wook Cho	David Lewis	Thomas Starai
Keith Chow	Jon Lewis	Peter Stassar
Keng Hua Chuang	Mike-Peng Li	Rene Struik
Charles Cook	Arthur H. Light	Walter Struppler
Eugene Dai	Kent Lusted	Mitsutoshi Sugawara
John D'Ambrosia	Elvis Maculuba	Patrik Sundstrom
Piers J. G. Dawe	Valerie Maguire	James Theodoras
Patrick Diamond	Jeffery Maki	David Thompson
Michael Dudek	Arthur Marris	Geoffrey Thompson
John French	Mick McCarthy	Michael Thompson
Matthias Fritzsche	Brett McClellan	Steven Tilden
Yukihiro Fujimoto	Thomas McDermott	Steve Trowbridge
Ali Ghiasi	Michael McInnis	Mark-Rene Uchida
Joel Goergen	Richard Mellitz	Alexander Umnov
Zhigang Gong	Tremont Miao	Paul Vanderlaan
James Graba	Jeffrey Moore	Dmitri Varsanofiev
Randall Groves	Charles Moorwood	George Vlantis
Robert Grow	Jose Morales	Khurram Waheed
Mark Gustlin	Michael Newman	Oded Wertheim
Adam Healey	Nick S. A. Nikjoo	Andreas Wolf
Marco Hernandez	Paul Nikolic	Peter Wu
David Hess	Mark Nowell	Jun Xu
Yasuo Hidaka	Satoshi Obara	Oren Yuen
Guido Hertz	Thomas Palkert	Zhen Zhou

When the IEEE-SA Standards Board approved this amendment on 6 December 2017, it had the following membership:

Jean-Philippe Faure, Chair
Gary Hoffman, Vice Chair
John D. Kulick, Past Chair
Konstantinos Karachalios, Secretary

Chuck Adams	Thomas Kochy	Robby Robson
Masayuki Ariyoshi	Joseph L. Koepfinger*	Dorothy Stanley
Ted Burse	Kevin Lu	Adrian Stephens
Stephen Dukes	Daleep Mohla	Mehmet Ulema
Doug Edwards	Damir Novosel	Phil Wennblom
J. Travis Griffith	Ronald C. Petersen	Howard Wolfman
Michael Janezic	Annette D. Reilly	Yu Yuan

*Member Emeritus

Introduction

This introduction is not part of IEEE Std 802.3bs-2017, IEEE Standard for Ethernet—Amendment 10: Media Access Control Parameters, Physical Layers, and Management Parameters for 200 Gb/s and 400 Gb/s Operation.

IEEE Std 802.3™ was first published in 1985. Since the initial publication, many projects have added functionality or provided maintenance updates to the specifications and text included in the standard. Each IEEE 802.3 project/amendment is identified with a suffix (e.g., IEEE Std 802.3ba™-2010).

The half duplex Media Access Control (MAC) protocol specified in IEEE Std 802.3-1985 is Carrier Sense Multiple Access with Collision Detection (CSMA/CD). This MAC protocol was key to the experimental Ethernet developed at Xerox Palo Alto Research Center, which had a 2.94 Mb/s data rate. Ethernet at 10 Mb/s was jointly released as a public specification by Digital Equipment Corporation (DEC), Intel and Xerox in 1980. Ethernet at 10 Mb/s was approved as an IEEE standard by the IEEE Standards Board in 1983 and subsequently published in 1985 as IEEE Std 802.3-1985. Since 1985, new media options, new speeds of operation, and new capabilities have been added to IEEE Std 802.3. A full duplex MAC protocol was added in 1997.

Some of the major additions to IEEE Std 802.3 are identified in the marketplace with their project number. This is most common for projects adding higher speeds of operation or new protocols. For example, IEEE Std 802.3u™ added 100 Mb/s operation (also called Fast Ethernet), IEEE Std 802.3z added 1000 Mb/s operation (also called Gigabit Ethernet), IEEE Std 802.3ae added 10 Gb/s operation (also called 10 Gigabit Ethernet), IEEE Std 802.3ah™ specified access network Ethernet (also called Ethernet in the First Mile) and IEEE Std 802.3ba added 40 Gb/s operation (also called 40 Gigabit Ethernet) and 100 Gb/s operation (also called 100 Gigabit Ethernet). These major additions are all now included in and are superseded by IEEE Std 802.3-2015 and are not maintained as separate documents.

At the publication date of IEEE Std 802.3bs-2017, IEEE Std 802.3 is composed of the following documents:

IEEE Std 802.3-2015

[ISO/IEC/IEEE 8802-3:2017/Amd.10:2019](https://standards.ieee.org/standard/802.3-2015.html)

Section One—Includes Clause 1 through Clause 20 and Annex A through Annex H and Annex 4A. Section One includes the specifications for 10 Mb/s operation and the MAC, frame formats and service interfaces used for all speeds of operation.

Section Two—Includes Clause 21 through Clause 33 and Annex 22A through Annex 33E. Section Two includes management attributes for multiple protocols and speed of operation as well as specifications for providing power over twisted pair cabling for multiple operational speeds. It also includes general information on 100 Mb/s operation as well as most of the 100 Mb/s Physical Layer specifications.

Section Three—Includes Clause 34 through Clause 43 and Annex 36A through Annex 43C. Section Three includes general information on 1000 Mb/s operation as well as most of the 1000 Mb/s Physical Layer specifications.

Section Four—Includes Clause 44 through Clause 55 and Annex 44A through Annex 55B. Section Four includes general information on 10 Gb/s operation as well as most of the 10 Gb/s Physical Layer specifications.

Section Five—Includes Clause 56 through Clause 77 and Annex 57A through Annex 76A. Clause 56 through Clause 67 and Clause 75 through Clause 77, as well as associated annexes, specify subscriber access and other Physical Layers and sublayers for operation from 512 kb/s to 10 Gb/s, and defines services and protocol elements that enable the exchange of IEEE Std 802.3 format frames between

stations in a subscriber access network. Clause 68 specifies a 10 Gb/s Physical Layer specification. Clause 69 through Clause 74 and associated annexes specify Ethernet operation over electrical backplanes at speeds of 1000 Mb/s and 10 Gb/s.

Section Six—Includes Clause 78 through Clause 95 and Annex 83A through Annex 93C. Clause 78 specifies Energy-Efficient Ethernet. Clause 79 specifies IEEE 802.3 Organizationally Specific Link Layer Discovery Protocol (LLDP) type, length, and value (TLV) information elements. Clause 80 through Clause 95 and associated annexes includes general information on 40 Gb/s and 100 Gb/s operation as well the 40 Gb/s and 100 Gb/s Physical Layer specifications. Clause 90 specifies Ethernet support for time synchronization protocols.

IEEE Std 802.3bwTM-2015

Amendment 1—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 96. This amendment adds 100 Mb/s Physical Layer (PHY) specifications and management parameters for operation on a single balanced twisted-pair copper cable.

IEEE Std 802.3byTM-2016

Amendment 2—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 105 through Clause 112, Annex 109A, Annex 109B, Annex 109C, Annex 110A, Annex 110B, and Annex 110C. This amendment adds MAC parameters, Physical Layers, and management parameters for the transfer of IEEE 802.3 format frames at 25 Gb/s.

IEEE Std 802.3bqTM-2016

Amendment 3—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 113 and Annex 113A. This amendment adds new Physical Layers for 25 Gb/s and 40 Gb/s operation over balanced twisted-pair structured cabling systems.

IEEE Std 802.3bpTM-2016

Amendment 4—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 97 and Clause 98. This amendment adds point-to-point 1 Gb/s Physical Layer (PHY) specifications and management parameters for operation on a single balanced twisted-pair copper cable in automotive and other applications not utilizing the structured wiring plant.

IEEE Std 802.3brTM-2016

Amendment 5—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 99. This amendment adds a MAC Merge sublayer and a MAC Merge Service Interface to support for Interspersing Express Traffic over a single link.

IEEE Std 802.3bnTM-2016

Amendment 6—This amendment adds the Physical Layer specifications and management parameters for symmetric and/or asymmetric operation of up to 10 Gb/s on point-to-multipoint Radio Frequency (RF) distribution plants comprising either amplified or passive coaxial media. It also extends the operation of Ethernet Passive Optical Networks (EPON) protocols, such as Multipoint Control Protocol (MPCP) and Operation Administration and Management (OAM).