

INTERNATIONAL
STANDARD

ISO/IEC/
IEEE
8802-1Q

First edition
2016-03-15

AMENDMENT 4
2017-11

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

**Part 1Q:
Bridges and bridged networks**

AMENDMENT 4: Frame preemption

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

Partie 1Q: Ponts et réseaux pontés

AMENDEMENT 4: Prémption de trame



Reference number
ISO/IEC/IEEE 8802-1Q:2016/Amd.4:2017(E)

Documents
Document Sharing Hub
© IEEE 2016



COPYRIGHT PROTECTED DOCUMENT

© IEEE 2016

All rights reserved. Unless otherwise specified, 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 address below or ISO's member body in the country of the requester.

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

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

stds.ipr@ieee.org
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.

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.

The main task of ISO/IEC JTC 1 is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is called to the possibility that implementation of this standard may require the use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. ISO/IEEE is not responsible for identifying essential patents or patent claims for which a license may be required, for conducting inquiries into the legal validity or scope of patents or patent claims or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance or a Patent Statement and Licensing Declaration Form, 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 ISO or the IEEE Standards Association.

ISO/IEC/IEEE 8802-1Q:2016/Amd.4 was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE STD 802.1Qb-2014). It was adopted by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*, in parallel with its approval by the ISO/IEC national bodies, under the “fast-track procedure” defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE. IEEE is responsible for the maintenance of this document with participation and input from ISO/IEC national bodies.

IEEE Std 802.1Qbu™-2016
(Amendment to
IEEE Std 802.1Q™-2014)

**IEEE Standard for
Local and metropolitan area networks—**

Bridges and Bridged Networks— Amendment 26: Frame Preemption

Sponsor

**LAN/MAN Standards Committee
of the
IEEE Computer Society**

Approved 30 June 2016
IEEE-SA Standards Board

Abstract: Enhancements to the forwarding process that support frame preemption are provided in this amendment to IEEE Std 802.1Q-2014.

Keywords: Bridged Local Area Networks, IEEE 802.1Q™, LANs, local area networks, MAC Bridges, metropolitan area networks, preemption, Virtual Bridged Local Area Networks, virtual LANs

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

Copyright © 2016 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 30 August 2016. 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 978-1-5044-2257-4 STD21074
Print: ISBN 978-1-5044-2258-1 STDPD21074

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 Notice” or “Important Notices and Disclaimers Concerning IEEE Standards Documents.”

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. Volunteers 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 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

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-SA Website at <http://ieeexplore.ieee.org/browse/standards/collection/ieee> 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

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.

Patents

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 Patent 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

At the time this standard was completed, the IEEE 802.1 working group had the following membership:

Glenn Parsons, Chair
John Messenger, Vice-Chair
Michael Johas Teener, Chair, Time Sensitive Networking Task Group
Tony Jeffree, Editor

Christian Boiger	Stephan Kehrer	Jessy Rouyer
Paul Bottorff	Marcel Kiessling	Panagiotis Saltsidis
David Chen	Philippe Klein	Michael Seaman
Feng Chen	Jouni Korhonen	Daniel Sexton
Weiyang Cheng	Yizhou Li	Johannes Specht
Rodney Cummings	Christophe Mangin	Wilfried Steiner
Janos Farkas	Tom McBeath	Patricia Thaler
Norman Finn	James McIntosh	David Thornburg
Geoffrey Garner	Hiroki Nakano	Jeremy Touve
Eric Gray	Bob Noseworthy	Paul Unbehagen
Craig Gunther	Donald R. Pannell	Karl Weber
Stephen Haddock	Walter Pieniac	Brian Weis
Mark Hantel	Karen Randall	Jordon Woods
Marc Holness	Maximilian Riegel	Helge Zinner
Hal Keen	Dan Romascanu	Juan Carlos Zuniga

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

Thomas Alexander	Michael Johas Teener	Dan Romascanu
Butch Anton	Adri Jovin	Jessy Rouyer
Lee Armstrong	Shinkyo Kaku	Larry Samberg
Stefan Aust	Piotr Karocki	Bartien Sayogo
Christian Boiger	Stuart Kerry	Michael Seaman
Nancy Bravin	Yongbum Kim	David Solomon
William Byrd	Robert Landman	Kevin Stanton
Juan Carreon	Mark Laubach	Thomas Starai
Rodney Cummings	David Lewis	Eugene Stoudenmire
Janos Farkas	Arthur H. Light	Walter Struppler
Yukihiro Fujimoto	William Lumpkins	Michael Swearingen
David Gregson	Michael Lynch	Patricia Thaler
Randall Groves	Elvis Maculuba	Mark-Rene Uchida
Stephen Haddock	Arthur Marris	Lorenzo Vangelista
Marek Hajduczenia	Jonathon McLendon	Dmitri Varsanofiev
Jerome Henry	Richard Mellitz	George Vlantis
Marco Hernandez	Charles Moorwood	Khurram Waheed
Guido Hiertz	Michael Newman	Stephen Webb
Werner Hoelzl	Nick S.A. Nikjoo	Karl Weber
C. Huntley	Satoshi Obara	Hung-Yu Wei
Noriyuki Ikeuchi	Alon Regev	Natalie Wienckowski
Atsushi Ito	Robert Robinson	Oren Yuen
Tony Jeffree	Benjamin Rolfe	Zhen Zhou

IEEE Std 802.1Qbu-2016
IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—
Amendment 26: Frame Preemption

When the IEEE-SA Standards Board approved this standard on 30 June 2016, it had the following membership:

Jean-Philippe Faure, *Chair*
Ted Burse, *Vice-Chair*
John D. Kulick, *Past Chair*
Konstantinos Karachalios, *Secretary*

Chuck Adams
Masayuki Ariyoshi
Stephen Dukes
Jianbin Fan
J. Travis Griffith
Gary Hoffman

Ronald W. Hotchkiss
Michael Janezic
Joseph L. Koepfinger*
Hung Ling
Kevin Lu
Annette D. Reilly
Gary Robinson

Mehmet Ulema
Yingli Wen
Howard Wolfman
Don Wright
Yu Yuan
Daidi Zhong

*Member Emeritus

Introduction

This introduction is not part of IEEE Std 802.1Qbu-2016, IEEE Standard for Local and metropolitan area networks—Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks—Amendment 26: Frame Preemption.

This amendment to IEEE Std 802.1Q-2014 provides enhancements to the forwarding process that support frame preemption.

This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are anticipated within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Information on the current revision state of this and other IEEE 802 standards may be obtained from

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

IEEE Std 802.1Qbu-2016
IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—
Amendment 26: Frame Preemption

Contents

2. Normative references	13
3. Definitions	14
4. Abbreviations	15
5. Conformance	16
5.4 VLAN Bridge component requirements	16
5.13 MAC Bridge component requirements	16
5.26 End station requirements—enhancements for frame preemption	16
6. Support of the MAC Service	17
6.7 Support of the Internal Sublayer Service by specific MAC procedures	17
8. Principles of bridge operation	18
8.6 The Forwarding Process	18
12. Bridge management	20
12.30 Managed objects for frame preemption	20
17. Management Information Base (MIB)	22
17.2 Structure of the MIB	22
17.3 Relationship to other MIBs	22
17.4 Security considerations	23
17.7 MIB modules	23
Annex A (normative) PICS proforma—Bridge implementations	43
A.5 Major capabilities	43
A.14 Bridge management	43
A.24 Management Information Base (MIB)	43
A.44 Frame preemption	44
Annex B (normative) PICS proforma—End station implementations	45
B.5 Major capabilities	45
B.15 Scheduled traffic	45
Annex Q (informative) Preemption and IEEE Std 802.1AE MAC Security	46
Annex R (informative) Preemption and scheduled traffic	48
R.1 Scheduling used in isolation	48
R.2 Preemption used in isolation	48
R.3 Scheduling and preemption used in combination, no HOLD/RELEASE	49
R.4 Scheduling and preemption used in combination, with HOLD/RELEASE	49
R.5 Bandwidth allocation and express traffic	50
Annex S (informative) Bibliography	51

Tables

Table 8-6 Gate operations 19
Table 12-29 Frame Preemption Parameter Ttable 20
Table 17-29 IEEE8021-Preemption-MIB Structure and relationship to this standard 22

IEEE Std 802.1Qbu-2016
IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—
Amendment 26: Frame Preemption

IEEE Standard for
Local and metropolitan area networks—

Bridges and Bridged Networks— Amendment 26: Frame Preemption

(This amendment is based on IEEE Std 802.1Q™-2014 as amended by IEEE Std 802.1Qbv-2015.)

NOTE—The editing instructions contained in this amendment define how to merge the material contained here into the base document and its other amendments to form the new comprehensive standard.

Editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed either by using ~~striketrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.¹

IMPORTANT NOTICE: IEEE Standards documents are not intended to ensure safety, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers 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.

This IEEE document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading “Important Notice” or “Important Notices and Disclaimers Concerning IEEE Documents.” They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/IPR/disclaimers.html>.

¹Notes in text, tables, and figures are given for information only, and do not contain requirements needed to implement the standard.

IEEE Std 802.1Qbu-2016
IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks—
Amendment 26: Frame Preemption

2. Normative references

Insert the following reference in the appropriate collating sequence:

IEEE Std 802.3br™, IEEE Approved Draft Standard for Ethernet—Amendment 5: Specification and Management Parameters for Interspersing Express Traffic.

3. Definitions

Insert the following definition in the appropriate collating sequence and renumber appropriately:

3.x preemption: The suspension of the transmission of a preemptable frame to allow one or more express frames to be transmitted before transmission of the preemptable frame is resumed.