

Information technology—

Telecommunications and information exchange between systems—

Local and metropolitan area networks—Specific requirements—

Supplement to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications—

Frame Extensions for Virtual Bridged Local Area Network (VLAN) Tagging on 802.3 Networks

Sponsor

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

Approved 16 September 1998

IEEE-SA Standards Board

Abstract: Changes and additions to IEEE Std 802.3, 1998 Edition, to support Virtual Bridged Local Area Networks (VLANs) as specified in IEEE P802.1Q, Draft Standard for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks, are provided.

Keywords: data processing; Ethernet; information interchange, local area networks; local area networks, management; models; mode of data transmission; network interconnection; repeater; type field

The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street, New York, NY 10017-2394, USA

Copyright © 1998 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 1998. Printed in the United States of America.

Print: ISBN 0-7381-1421-9 SH94675
PDF: ISBN 0-7381-1422-7 SS94675

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.

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. Members of the committees serve voluntarily and without compensation. They are not necessarily members of the Institute. The standards developed within IEEE represent a consensus of the broad expertise on the subject within the Institute as well as those activities outside of IEEE that have expressed an interest in participating in the development of the standard.

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. Every IEEE Standard is subjected to review at least every five years for revision or reaffirmation. When a document is more than five years old and has not been reaffirmed, 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.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of all concerned interests, it is important to ensure that any interpretation has also received 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 interpretation requests except in those cases where the matter has previously received formal consideration.

Comments on standards and requests for interpretations should be addressed to:

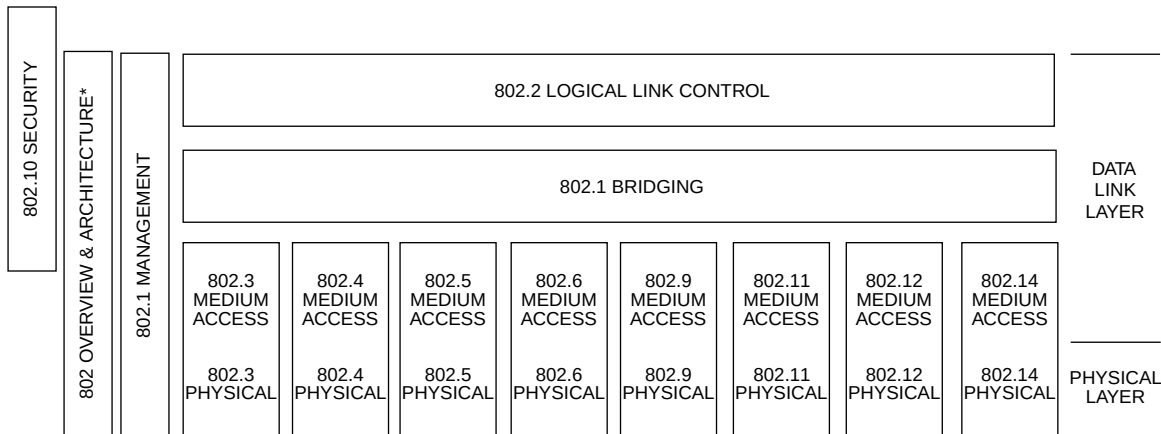
Secretary, IEEE-SA Standards Board
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
USA

Note: 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 with respect to the existence or validity of any patent rights in connection therewith. The IEEE shall not be responsible for identifying patents for which a license may be required by an IEEE standard or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention.

Authorization to photocopy portions of any individual standard for internal or personal use is granted by the Institute of Electrical and Electronics Engineers, Inc., provided that the appropriate fee is paid to Copyright Clearance Center. To arrange for payment of licensing fee, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; (978) 750-8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Introduction to IEEE Std 802.3ac-1998

This standard is part of a family of standards for local and metropolitan area networks. The relationship between the standard and other members of the family is shown below. (The numbers in the figure refer to IEEE standard numbers.)



* Formerly IEEE Std 802.1A.

This family of standards deals with the Physical and Data Link layers as defined by the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) Basic Reference Model (ISO/IEC 7498-1 : 1994). The access standards define seven types of medium access technologies and associated physical media, each appropriate for particular applications or system objectives. Other types are under investigation.

The standards defining the technologies noted above are as follows:

- IEEE Std 802 *Overview and Architecture.* This standard provides an overview to the family of IEEE 802 Standards.
- ANSI/IEEE Std 802.1B and 802.1k [ISO/IEC 15802-2] *LAN/MAN Management.* Defines an OSI management-compatible architecture, and services and protocol elements for use in a LAN/MAN environment for performing remote management.
- ANSI/IEEE Std 802.1D *Media Access Control (MAC) Bridges.* Specifies an architecture and protocol for the interconnection of IEEE 802 LANs below the MAC service boundary.
- ANSI/IEEE Std 802.1E [ISO/IEC 15802-4] *System Load Protocol.* Specifies a set of services and protocol for those aspects of management concerned with the loading of systems on IEEE 802 LANs.
- ANSI/IEEE Std 802.1F *Common Definitions and Procedures for IEEE 802 Management Information*
- ANSI/IEEE Std 802.1G [ISO/IEC 15802-5] *Remote Media Access Control (MAC) Bridging.* Specifies extensions for the interconnection, using non-LAN communication technologies, of geographically separated IEEE 802 LANs below the level of the logical link control protocol.
- IEEE Std 802.1H [ISO/IEC TR 11802-5] *Media Access Control (MAC) Bridging of Ethernet V2.0 in Local Area Networks*
- ANSI/IEEE Std 802.2 [ISO/IEC 8802-2] *Logical Link Control*
- ANSI/IEEE Std 802.3 *CSMA/CD Access Method and Physical Layer Specifications*

- ANSI/IEEE Std 802.4 [ISO/IEC 8802-4] *Token Passing Bus Access Method and Physical Layer Specifications*
- ANSI/IEEE Std 802.5 [ISO/IEC 8802-5] *Token Ring Access Method and Physical Layer Specifications*
- ANSI/IEEE Std 802.6 [ISO/IEC 8802-6] *Distributed Queue Dual Bus Access Method and Physical Layer Specifications*
- ANSI/IEEE Std 802.9 [ISO/IEC 8802-9] *Integrated Services (IS) LAN Interface at the Medium Access Control (MAC) and Physical (PHY) Layers*
- ANSI/IEEE Std 802.10 *Interoperable LAN/MAN Security*
- ANSI/IEEE Std 802.11 [ISO/IEC DIS 8802-11] *Wireless LAN Medium Access Control (MAC) and Physical Layer Specifications*
- ANSI/IEEE Std 802.12 [ISO/IEC 8802-12] *Demand Priority Access Method, Physical Layer and Repeater Specifications*

In addition to the family of standards, the following is a recommended practice for a common Physical Layer technology:

- IEEE Std 802.7 *IEEE Recommended Practice for Broadband Local Area Networks*

The following additional working group has authorized standards projects under development:

- IEEE 802.14 *Standard Protocol for Cable-TV Based Broadband Communication Network*

Conformance test methodology

An additional standards series, identified by the number 1802, has been established to identify the conformance test methodology documents for the 802 family of standards. Thus the conformance test documents for 802.3 are numbered 1802.3.

IEEE Std 802.3ac-1998

This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are anticipated to this standard within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Details on the contents of this standard are provided on the following pages.

The IEEE 802.3 Working Group acknowledges and appreciates that many concepts embodied in this standard are based largely upon the CSMA/CD access method earlier described in *The Ethernet* specification as written jointly by individuals from Xerox Corporation, Digital Equipment Corporation, and Intel Corporation. Appreciation is also expressed to Robert M. Metcalfe and David R. Boggs for their pioneering work in establishing the original concepts.

Participants

When the IEEE 802.3 Working Group approved this standard, it had the following membership:

Geoffrey O. Thompson, Chair

David J. Law, Vice Chair

Andy J. Luque, Secretary

Ian Crayford, Chair, 802.3ac Task Force

Rich Seifert, Editor, 802.3ac Task Force

Oscar Agazzi	Howard Frazier	Larry Lomelino	Michael M. Salzman
Paul Ahrens	Ken Friedenbach	Jahan Lotfi	Mark Sankey
Alan Albrecht	Richard Froke	Brian MacLeod	Bill Sarles
Don Alderrou	Judy Fuess	Kenneth MacLeod	David Schwartz
Abe Ali	Robin Gangopadhy	Rabih Makarem	Mick Seaman
Khaled Amer	Mark Gerhold	Jim Mangin	Koichiro Seto
Steve Augusta	Tom Grasmehr	Arlen Martin	Cheng-Chung Shih
Kameran Azadet	Bryan Gregory	Scott Mason	Ramin Shirani
Bruce Bandali	Richard Grenier	Thomas Mathey	Bharat Singh
Denis Beaudoin	Edward Grivna	Joseph Mazor	Andrew Smith
John L. Bestel	Robert M. Grow	Kelly McClellan	David Smith
Brad Booth	Stephen Haddock	John McCool	Michael Smith
John Bowerman	G. Y. Hanna	Grahame Measor	Walter Sotelo
Richard Bowers	Del Hanson	Vince Melendy	Ben Speiser
Steve Brewer	Mehdi Hatamian	John Messenger	Margit Stearns
Dave Brier	Kirk Hayden	Steve Metzger	Rick Strohmayr
Benjamin Brown	Claude Hayek	Tremont Miao	Steve Swanson
Daniel J. Brown	Gaby Hecht	Colin Mick	Andre Szczepanek
Bill Bunch	Ariel Hendel	Bruce D. Miller	Tad Szostak
Ed Cady	Henry Hinrichs	Fanny Mlinarsky	Rich Taborek
John Cagle	Charlie Hochstedler	Mart L. Molle	Wen-Tsung Tang
Richard Cam	Henry Hsiaw	Octavio Morales	Jim Tatum
Bob Campbell	Jacob Hsu	Shankar Mukherjee	Sadry Tavana
Edward Chang	Todd Hudson	Shimon Muller	Ken Taylor
Linda Cheng	Ajit Jadeja	Denis Murphy	Vivek Telang
Hon Wah Chin	Tony Jeffree	Samba Murthy	Pat Thaler
Henry Choy	Howard Johnson	Robert Musk	Jonathan R. Thatcher
George Chu	Scott Johnson	Ken Naganuma	Walter Thirion
Kelly B. Coffey	Thomas K. Jørgensen	Kristian Nelson	Douglas Thomson
David Cunningham	Juan Jover	Paul Nikolich	Carlos Tomaszewski
Robert Curtis	Jayant Kadambi	David Nim	Hiep Tran
Robert Dahlgren	Vic Kairis	Mark Nowell	Jacob Twersky
Kevin Daines	Shinkyo Kaku	Ivan Oakley	Todd Vafiades
Subrata Datta	Mohan Kalkunte	Satoshi Obara	Schelto van Doorn
Moshe De-Leon	Amrit Kalla	Mitsuji Okada	David J. Van Goor
Tom Debiec	Sumesh Kaul	Paul Pace	Bill Verheggen
Dave Delaney	Tuan Khuu	Jim Parker	Iain Verigin
Sanjay Desai	Richard Knight	Jerry Pate	Greg Wang
Thomas Dineen	Paul Kolesar	John Payne	Yun-Che Wang
Dan Dove	Kishan Rao Konda	William Quackenbush	Jeff Warren
Steve Dreyer	Josef Kosilek	Sreen Raghavan	Jim Welch
George Eisler	Richard LaCerte	Sailesh K. Rao	Willem Wery
Michael Elswick	Hans Lackner	Peter Rautenberg	Mike Witkowski
Nick Esser	Gadi Lahat	Gary Robinson	John Wolcott
Daniel Essig	Gordon Langlands	Carlos Rodriguez	Don Wong
Mark Feuerstraeter	Bruce LaVigne	Floyd Ross	Robert Wu
Dave Fifield	Fu-Ho Lee	Tony Rowell	Stefan M. Wurster
Norman Finn	Tommy Leung	Archana Roy	Michael Yam
John Fitzgerald	Chan-De Lin	Khosrow Sadeghi	Mark Yu
Alan Flatman	Ray Lin	Dalit Sagi	Igor Zhovnirovsky

The following persons were on the balloting committee:

William B. Adams	Allen W. Hathaway	Paul Nikolich
Don Alderrou	Jacob J. Hsu	Donal O'Mahony
Corey Anderson	Thomas R. Hunwick	Kaveh Pahlavan
Kit Athul	Walter K. Hurwitz	Roger Pandanda
William E. Ayen	Neil A. Jarvis	Lucy W. Person
Thomas W. Bailey	Tony Jeffree	Ronald C. Petersen
Brad J. Booth	Howard Johnson	Vikram Punj
Steve Brewer	K. H. Kellermayr	Andris Putnins
Peter K. Campbell	Edward R. Kelly	Sreen Raghavan
James T. Carlo	Yongbum Kim	Edouard Y. Rocher
David E. Carlson	Daniel R. Krent	Gary S. Robinson
Paul Chen	Stephen Barton Kruger	James W. Romlein
Bernard Daines	Kenneth C. Kung	Floyd E. Ross
Thomas J. Dineen	William G. Lane	Dalit Sagi
Christos Douligeris	David J. Law	Norman Schneidewind
Sourav K. Dutta	Lanse M. Leach	Rich Seifert
Philip H. Enslow	William Lidinsky	Michael A. Smith
Robert L. Faulk	Ray Lin	William R. Smith
John W. Fendrich	Randolph S. Little	Efstathios D. Sykas
David Fifield	Peter Martini	Patricia Thaler
Howard M. Frazier	Milan Merhar	Geoffrey O. Thompson
Harvey A. Freeman	John L. Messenger	Mark-Rene Uchida
Ken J. Friedenbach	Bennett Meyer	Emmanuel Van Lil
Gautam Garai	Colin K. Mick	Sarosh N. Vesuna
Joel R. Goergen	Refik Molva	John Viaplana
Patrick S. Gonia	Warren Monroe	Donald F. Weir
Robert M. Grow	John E. Montague	Jerry A. Wyatt
Stephen R. Haddock	Shimon Muller	Qian-li Yang
	Ken Naganuma	

When the IEEE-SA Standards Board approved this standard on 16 September 1998, it had the following membership:

Richard J. Holleman, *Chair*

Donald N. Heirman, *Vice Chair*

Judith Gorman, *Secretary*

Satish K. Aggarwal	James H. Gurney	L. Bruce McClung
Clyde R. Camp	Jim D. Isaak	Louis-François Pau
James T. Carlo	Lowell G. Johnson	Ronald C. Petersen
Gary R. Engmann	Robert Kennelly	Gerald H. Peterson
Harold E. Epstein	E. G. "Al" Kiener	John B. Posey
Jay Forster*	Joseph L. Koepfinger*	Gary S. Robinson
Thomas F. Garrity	Stephen R. Lambert	Hans E. Weinrich
Ruben D. Garzon	Jim Logothetis	Donald W. Zipse
	Donald C. Loughry	

*Member Emeritus

Kristin M. Dittmann
IEEE Standards Project Editor