

INTERNATIONAL
STANDARD

ISO/IEC/
IEEE
8802-1BA

First edition
2016-10-15

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

**Part 1BA:
Audio video bridging (AVB) systems**

*Technologies de l'information — Télécommunications et échange
d'informations entre systèmes — Réseaux de zones locales et
métropolitaines — Exigences spécifiques —*

Partie 1BA: Systèmes de pontage audio-vidéo (AVB)

Reference number
ISO/IEC/IEEE 8802-1BA:2016(E)



© IEEE 2011 – All rights reserved



COPYRIGHT PROTECTED DOCUMENT

© IEEE 2011

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 ISO or IEEE at the respective 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.

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

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 8802-1BA was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information Technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems* in cooperation with the Systems and Software Engineering Standards Committee of the IEEE Computer Society, under the Partner Standards Development Organization cooperation agreement between ISO and IEEE.

**IEEE Standard for
Local and metropolitan area networks—
Audio Video Bridging (AVB) Systems**

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE
3 Park Avenue
New York, NY 10016-5997
USA

IEEE Std 802.1BA™-2011

30 September 2011

IEEE Std 802.1BA™-2011

**IEEE Standard for
Local and metropolitan area networks—
Audio Video Bridging (AVB) Systems**

Sponsor

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

Approved 10 September 2011

IEEE-SA Standards Board

Abstract: Profiles that select features, options, configurations, defaults, protocols and procedures of bridges, stations and LANs that are necessary to build networks that are capable of transporting time-sensitive audio and/or video data streams are defined in this standard.

Keywords: audio video bridging, AVB, Bridged Local Area Networks, IEEE 802.1BA, LANs, local area networks, MAC Bridges, MANs, metropolitan area networks, time sensitive data streams, 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 © 2011 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 30 September 2011. 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 978-0-7381-6739-8 STD97154
Print: ISBN 978-0-7381-6740-4 STDPD97154

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.

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 or the soundness of any judgments contained in its standards.

Use of an IEEE Standard is wholly voluntary. The IEEE disclaims liability for any personal injury, property or other damage, of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon this, or any other IEEE Standard document.

The IEEE does not warrant or represent the accuracy or content of the material contained herein, and expressly disclaims any express or implied warranty, including any implied warranty of merchantability or fitness for a specific purpose, or that the use of the material contained herein is free from patent infringement. IEEE Standards documents are supplied “**AS IS.**”

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, or every ten years for stabilization. When a document is more than five years old and has not been reaffirmed, or more than ten years old and has not been stabilized, 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 publishing and making this document available, the IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity. Nor is the IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing this, and any other IEEE Standards document, should rely upon the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

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 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. A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal interpretation of the 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, explanation, or interpretation of the IEEE. 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. Recommendations to change the status of a stabilized standard should include a rationale as to why a revision or withdrawal is required.

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

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

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; +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.

Introduction

This introduction is not part of IEEE Std 802.1BA-2011, IEEE Standard for Local and metropolitan area networks—Audio Video Bridging (AVB) Systems.

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

Notice to users

Laws and regulations

Users of these documents should consult all applicable laws and regulations. Compliance with the provisions of this standard 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

This document is copyrighted by the IEEE. It is made available 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 this document available for use and adoption by public authorities and private users, the IEEE does not waive any rights in copyright to this document.

Updating of IEEE documents

Users of IEEE standards 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. 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 Standards Association website at <http://ieeexplore.ieee.org/xpl/standards.jsp>, or contact the IEEE at the address listed previously.

For more information about the IEEE Standards Association or the IEEE standards development process, visit the IEEE-SA website at <http://standards.ieee.org>.

Errata

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

Interpretations

Current interpretations can be accessed at the following URL: <http://standards.ieee.org/findstds/interps/index.html>.

Patents

Attention is called to the possibility that implementation of this amendment may require use of subject matter covered by patent rights. By publication of this amendment, no position is taken with respect to the existence or validity of any patent rights in connection therewith. 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 amendment 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 submitted to the IEEE-SA for approval, the IEEE 802.1 Working Group had the following membership:

Tony Jeffree, *Chair and Editor*

Paul Congdon, *Vice Chair*

Michael Johas Teener, *Chair, AV Bridging Task Group*

Zehavit Alon
Yafan An
Ting Ao
Peter Ashwood-Smith
Christian Boiger
Paul Bottorff
Rudolf Brandner
Craig Carlson
Rodney Cummings
Claudio Desanti
Zheming Ding
Donald Eastlake, III
Janos Farkas
Donald Fedyk
Norman Finn
Ilango Ganga
Geoffrey Garner
Anoop Ghanwani
Mark Gravel

Eric Gray
Yingjie Gu
Craig Gunther
Stephen Haddock
Hitoshi Hayakawa
Hal Keen
Srikanth Keesara
Yongbum Kim
Philippe Klein
Oliver Kleineberg
Michael Krause
Lin Li
Jeff Lynch
Ben Mack-Crane
David Martin
John Messenger
John Morris
Eric Multanen

David Olsen
Donald Pannell
Glenn Parsons
Mark Pearson
Joseph Pelissier
Rene Raeber
Karen Randall
Josef Roese
Dan Romascanu
Jessy Rouyer
Ali Sajassi
Panagiotis Saltsidis
Michael Seaman
Rakesh Sharma
Kevin Stanton
Robert Sultan
Patricia Thaler
Chait Tumuluri
Maarten Vissers

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

Thomas Alexander	Randall Groves	Nick S. A. Nikjoo
Mark Anderson	Ashwin Gumaste	Paul Nikolich
Butch Anton	Craig Gunther	Satoshi Obara
Lee Armstrong	Oliver Hoffmann	David Olsen
Hugh Barrass	David Hunter	Glenn Parsons
Robert Boatright	Atsushi Ito	Maximilian Riegel
Tomo Bogataj	Raj Jain	Robert Robinson
Nancy Bravin	Junghoon Jee	Benjamin Rolfe
William Byrd	Anthony Jeffree	Jessy Rouyer
James Carlo	Michael Johas Teener	Randall Safier
Juan Carreon	Vincent Jones	Peter Saunderson
David Chalupsky	Shinkyoo Kaku	Bartien Sayogo
Keith Chow	Piotr Karocki	Gil Shultz
Henrik Christensen	Stuart J. Kerry	Kapil Sood
Charles Cook	Max Kicherer	Amjad Soomro
Rodney Cummings	Yongbum Kim	Kevin B. Stanton
Fumio Daido	Jeff Koftinoff	Thomas Starai
Wael Diab	Bruce Kraemer	Adrian Stephens
Patrick Diamond	David Landry	Walter Struppler
Russell Dietz	Juan L. Lazaro	Joseph Tardo
Thomas Dineen	Michael Lerer	Patricia Thaler
Sourav Dutta	Shen Loh	David Thompson
John Egan	Greg Luri	Geoffrey Thompson
C. Fitzgerald	Elvis Maculuba	Scott Valcourt
Yukihiro Fujimoto	Arthur Marris	Prabodh Varshney
John Fuller	Jonathon McLendon	Karl Weber
Geoffrey Garner	Matthew Mora	Oren Yuen
Devon Gayle	Michael S. Newman	George Zimmerman
David Goodall	Charles Ngethe	

When the IEEE-SA Standards Board approved this standard on 10 September 2011, it had the following membership:

Richard H. Hulett, *Chair*
John Kulick, *Vice Chair*
Robert M. Grow, *Past Chair*
Judith Gorman, *Secretary*

Masayuki Ariyoshi
William Bartley
Ted Burse
Clint Chaplin
Wael Diab
Jean-Philippe Faure
Alexander Gelman
Paul Houzé

Jim Hughes
Joseph L. Koepfinger*
David J. Law
Thomas Lee
Hung Ling
Oleg Logvinov
Ted Olsen

Gary Robinson
Jon Walter Rosdahl
Sam Sciacca
Mike Seavey
Curtis Siller
Phil Winston
Howard L. Wolfman
Don Wright

*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

Satish Aggarwal, NRC Representative
Richard DeBlasio, DOE Representative
Michael Janezic, NIST Representative

Catherine Berger
IEEE Project Editor

Patricia Gerdon
IEEE Standards Program Manager, Technical Program Development

Contents

1. Overview	1
1.1 Scope	1
1.2 Purpose	1
1.3 Introduction	1
1.4 Objectives	2
2. Normative references	3
3. Definitions	5
4. Acronyms and abbreviations	6
5. Architecture of AVB networks	7
6. AVB functions	11
6.1 Energy Efficient Ethernet	11
6.2 Flow control	11
6.3 Frame sizes	12
6.4 Detection of AVB domains	12
6.5 Meeting latency targets for SR classes A and B	13
6.6 Variable data rate LANs	16
6.7 Basic support for streams	17
6.8 Minimum Bridge requirements	18
6.9 IEEE 802.1AS time-synchronization event message transmission interval	19
6.10 Effect of hop count on IEEE 802.1AS accuracy	19
7. AVB profiles	20
7.1 Introduction to PCS proformas	20
7.2 Abbreviations and special symbols	21
7.3 Instructions for completing the PCS proforma	21
7.4 Common requirements	23
Annex A (informative) Bibliography	31

List of figures

Figure 5-1	An AVB network	7
Figure 5-2	AVB domain boundaries created by non-AVB systems.....	8
Figure 5-3	AVB domain boundaries created by different SR class A priorities	9
Figure 5-4	AVB domain boundaries created by different SR class B priorities.....	10

List of tables

Table 6-1	AVB support in LAN technologies	13
Table 6-2	Latency targets for SR classes A and B	14

IEEE Standard for Local and metropolitan area networks— Audio Video Bridging (AVB) Systems

IMPORTANT NOTICE: This standard is not intended to ensure safety, security, health, or environmental protection. Implementers of the standard are responsible for determining appropriate safety, security, environmental, and health practices or regulatory requirements.

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>.

1. Overview

1.1 Scope

This standard defines profiles that select features, options, configurations, defaults, protocols and procedures of bridges, stations and LANs that are necessary to build networks that are capable of transporting time sensitive audio and/or video data streams.

1.2 Purpose

The purpose of this standard is to specify defaults and profiles that manufacturers of LAN equipment can use to develop AVB-compatible LAN components, and to enable a person not skilled in networking to build a network, using those components, that does not require configuration to provide working audio and/or video services.

1.3 Introduction

The successful support of time sensitive audio and/or video data streams in a Bridged LAN requires the selection of specific features and options that are specified in a number of different standards, some of which are standards developed in IEEE 802, and others (in particular, those that relate to functionality in OSI layer 3 and above ISO/IEC 7498-1:1994 [B3]) that are developed by other bodies. In this standard, it is the selection of features and options that support OSI layer 1 and 2 LAN functionality that is of interest, in order to specify the requirements for LAN support both in Bridges and the end stations that attach to them.

The standards from which features and options are selected by this standard are as follows:

- a) The VLAN Bridge specification in IEEE Std 802.1Q.

- b) The time synchronization standard, IEEE Std 802.1AS.
- c) The MAC and PHY standards specified for the various LAN MAC/PHY technologies, such as IEEE Std 802.3, IEEE Std 802.11, ITU-T G.9960 and ITU-T G.9961 (Powerline), and MoCA.

These features and options are selected by means of the profiles described in Clause 7. These profiles support specific functions within an AVB network, such as the Bridges and LAN technologies used to carry the AV streams, and the end stations that attach to the LAN and that provide the source(s) and the destination(s) of the stream data.

In some cases, there are functions that are needed in order to construct a usable AVB network, but that are not described in any other standard. In those cases, the technical specification is included in Clause 6 of this standard, along with a statement of the conformance requirements associated with the function, so that the function can be referenced by a profile in the same way as functions defined in any other standard.

Clause 5 introduces the architecture for AVB systems and AVB networks, and some of the terminology used in describing them.

1.4 Objectives

The architecture described in Clause 5, the AVB functions specified in Clause 6, and the profiles specified in Clause 7, are intended to meet the following objectives:

- a) Describe the components that can be combined to form an AVB network (i.e., a network whose components cooperate and interoperate to allow the transmission of AV streams) and how those components can be combined.
- b) Describe some of the consequences and limitations for AVB streaming that result from the incorporation of non-AV capable devices in an AVB network.
- c) Define additional functions that are required for AVB operation that are not otherwise documented in contributing standards.
- d) Provide guidance in terms of meeting the end-to-end latency requirements for successful AVB operation.
- e) Define conformance requirements for AVB systems, in terms of the standards to which conformance is required for the various system components and the optional features of those standards that are required to be implemented. These conformance requirements address the guaranteed delivery, end-to-end latency, and time synchronization requirements for successful AVB operation.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in the text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEEE Std 802[®], IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture.^{1, 2}

IEEE Std 802.1Q[™], IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks.

IEEE Std 802.1Qbb[™], IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks—Amendment: Priority-based Flow Control.

IEEE Std 802.1AS[™], IEEE Standards for Local and Metropolitan Area Networks: Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks.

IEEE Std 802.3[™], Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

IEEE Std 802.3az[™], Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications—Amendment 5: Media Access Control Parameters, Physical Layers, and Management Parameters for Energy-Efficient Ethernet.

IEEE Std 802.11[™], IEEE Standards for Local and Metropolitan Area Networks: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications.

IEEE Std 802.11n[™], IEEE Standards for Local and Metropolitan Area Networks: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications—Amendment 5: Enhancements for Higher Throughput.

IEEE Std 802.11v[™], IEEE Standards for Local and Metropolitan Area Networks: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications—Amendment 8: IEEE 802.11 Wireless Network Management.

IEEE P802.11aa[™]/D5.0, IEEE Standards for Local and Metropolitan Area Networks: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications—Amendment 2: MAC Enhancements for Robust Audio Video Streaming.³

ITU-T G.9960 (06/2010) Unified high-speed wireline based home networking transceivers—Revision 1.⁴

¹IEEE publications are available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, Piscataway, NJ 08854, USA (<http://standards.ieee.org/>).

²The IEEE standards or products referred to in this clause are trademarks of the Institute of Electrical and Electronics Engineers, Inc.

³This IEEE standards project was not approved by the IEEE-SA Standards Board at the time this publication went to press. For information about obtaining a draft, contact the IEEE.

⁴ITU-T publications are available from the International Telecommunications Union, Place des Nations, CH-1211, Geneva 20, Switzerland/Suisse (<http://www.itu.int/>).

IEEE Std 802.1BA-2011

LOCAL AND METROPOLITAN AREA NETWORKS

ITU-T G.9961 (06/2010) Data link layer (DLL) for unified high-speed wire-line based home networking transceivers.

MoCA MAC/PHY SPECIFICATION v2.0, (MoCA-M/P-SPEC-V2.0-20100507) Multimedia over Coax Alliance (www.mocalliance.org).