BSI Standards Publication

Telecommunications and information exchange between information technology systems — Requirements for local and metropolitan area networks

Part 1CM: Time-sensitive networking for fronthaul

bsi.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

National foreword

This British Standard is the UK implementation of ISO/IEC/ IEEE 8802-1CM:2019.

The UK participation in its preparation was entrusted to Technical Committee IST/6, Data communications.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2019
Published by BSI Standards Limited 2019

ISBN 978 0 539 02274 2

ICS 35.110

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2019.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

INTERNATIONAL STANDARD

ISO/IEC/IEEE 8802-1CM

First edition
2019-07

Telecommunications and information exchange between information technology systems — Requirements for local and metropolitan area networks —

Part 1CM: Time-sensitive networking for fronthaul

Télécommunications et échange entre systèmes informatiques — Exigences pour les réseaux locaux et métropolitains —

Partie 1CM: Réseaux à temps critique pour fronthaul

Reference number
ISO/IEC/IEEE 8802-1CM:2019(E)

Documents
Document Sharing Hub
© IEEE 2018

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

COPYRIGHT PROTECTED DOCUMENT

© IEEE 2018

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 IEEE at the address below.

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

Email: stds.ipr@ieee.org

Published in Switzerland

Documents
Document Sharing Hub

© IEEE 2018 – All rights reserved

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

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.

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) or the IEC list of patent declarations received (see http://patents.iec.ch).

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 8802-1CM was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE Std 802.1CM-2018) 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 SC 6, *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 2018 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

IEEE Std 802.1CM™-2018

IEEE Standard for
Local and metropolitan area networks—

Time-Sensitive Networking for Fronthaul

Sponsor

LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 7 May 2018

IEEE-SA Standards Board

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

Abstract: 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 fronthaul streams, which are time sensitive.

Keywords: bridged network, fronthaul, IEEE 802®, IEEE 802.1™, IEEE 802.1CM™, synchronization, time-sensitive networking, TSN, Virtual Local Area Network, VLAN, VLAN Bridge

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

Copyright © 2018 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 8 June 2018. 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.

Print: ISBN 978-1-5044-4909-0 STD23131
PDF: ISBN 978-1-5044-4910-6 STDPD23131

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.

Copyright © 2018 IEEE. All rights reserved.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

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/IPR/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.

Copyright © 2018 IEEE. All rights reserved.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

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.

Copyright © 2018 IEEE. All rights reserved.

AVA Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

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. A current 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/ 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 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.

Copyright © 2018 IEEE. All rights reserved.
Documents
Document Sharing Hub
Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

Participants

At the time of approval of this standard, the IEEE 802.1 Working Group had the following membership:

Glenn Parsons, *Chair*
John Messenger, *Vice Chair*
János Farkas, *Chair, Time-Sensitive Networking Task Group*, *Editor*

Ralf Assmann
Shenghua Bao
Gordon Bechtel
Jens Bierschenk
Steinar Bjørnstad
Christian Boiger
Paul Bottorff
Radhakrishna Canchi
David Chen
Feng Chen
Weiying Cheng
Paul Congdon
Rodney Cummings
Hesham ElBakoury
Norman Finn
Mickaël Fontaine
Geoffrey Garner
Eric W. Gray
Craig Gunther
Marina Gutiérrez
Stephen Haddock
Mark Hantel
Marc Holness
Lokesh Kabra
Michael Karl
Stephan Kehrer
Hajime Koto
Yizhou Li
Christophe Mangin
Scott Mansfield
James McIntosh
Robert Moskowitz
Tero Mustala
Tomoki Ohsawa
Donald R. Pannell
Walter Pienciak
Michael Potts
Wei Qiu
Karen Randall
Maximilian Riegel
Jessy V. Rouyer
Soheil Samii
Atsushi Sato
Frank Schewe
Michael Seaman
Johannes Specht
Patricia Thaler
Paul Unbehagen
Hao Wang
Tongtong Wang
Xinyuan Wang
Karl Weber
Brian Weis
Jordon Woods
Takahiro Yamaura
Xiang Yu
Nader Zein

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

Thomas Alexander
Butch Anton
Stefan Aust
Gordon Bechtel
Harry Bims
Steinar Bjørnstad
Christian Boiger
Demetrio Bucaneg, Jr.
William Byrd
Juan Carreon
Keith Chow
Todor Cooklev
Rodney Cummings
Lars Ellegaard
Marc Emmelmann
Yonggang Fang
János Farkas
Norman Finn
Avraham Freedman
Matthias Fritsche
Yukihiro Fujimoto
Devon Gayle
Eric W. Gray
Randall Groves
Stephen Haddock
Marco Hernandez
Werner Hoelzl
Noriyuki Ikeuchi
Atsushi Ito
Raj Jain
SangKwon Jeong
Piotr Karocki
Stuart Kerry
Yongbum Kim
Mark Laubach
Han Hyub Lee
Hyeong Ho Lee
John Lemon
Michael Lynch
Elvis Maculuba
Richard Maiden
Roger Marks
John Messenger
Michael Montemurro
Nick S. A. Nikjoo
Satoshi Obara
Robert O'Hara
Glenn Parsons
Bansi Patel
Clinton Powell
Alon Regev
Maximilian Riegel
Robert Robinson
Jessy V. Rouyer
Peter Saunderson
Michael Seaman
Thomas Starai
Walter Struppler
Bo Sun
Richard Tse
Mark-Rene Uchida
Dmitri Varsanofiev
Kari Vierimaa
George Vlantis
Khurram Waheed
Lisa Ward
Hung-Yu Wei
Andreas Wolf
Oren Yuen
Nader Zein
Zhen Zhou

Copyright © 2018 IEEE. All rights reserved.
Documents
Document Sharing Hub
Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

When the IEEE-SA Standards Board approved this standard on 7 May 2018, it had the following membership:

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

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

*Member Emeritus

Copyright © 2018 IEEE. All rights reserved.
Documents
Document Sharing Hub
Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

Introduction

This introduction is not part of IEEE Std 802.1CM-2018, IEEE Standard for Local and metropolitan area networks—Time-Sensitive Networking for Fronthaul.

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 fronthaul streams, which are time-sensitive.

Copyright © 2018 IEEE. All rights reserved.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

Contents

1. Overview 10

1.1 Scope 10
1.2 Purpose 10
1.3 Introduction 10

2. Normative references 12

3. Definitions 13

4. Acronyms and abbreviations 14

5. Conformance 16

5.1 Requirements terminology 16
5.2 Profile Conformance Statement (PCS) 16
5.3 Bridge requirements 16
5.4 Bridge options 17
5.5 End station requirements 18
5.6 End station options 18

6. Fronthaul 20

6.1 Evolved Universal Terrestrial Radio Access background 21
6.2 Class 1 requirements 21
6.3 Class 2 requirements 23
6.4 Synchronization requirements 26

7. Bridge and synchronization functions 31

7.1 Latency components 31
7.2 Bridge delay calculation 31
7.3 Frame preemption 33
7.4 Network synchronization 33
7.5 Flow control 37
7.6 Energy Efficient Ethernet 37

8. Fronthaul profiles 39

8.1 Profile A 40
8.2 Profile B 42

9. Synchronization solutions 44

9.1 Solution for Category A+ 44
9.2 Solutions for Category A 44
9.3 Solutions for Category B 44
9.4 Solutions for Category C 44

Annex A (normative) PCS proforma—Time-Sensitive Networking for Fronthaul Profiles 45

Annex B (informative) Delay calculation examples 55

Annex C (informative) Bibliography 59

Copyright © 2018 IEEE. All rights reserved.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

IEEE Standard for
Local and metropolitan area networks—

Time-Sensitive Networking for Fronthaul

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 fronthaul streams, which are time-sensitive.

NOTE—Stream and flow are used as synonyms in this document.[1]

1.2 Purpose

The purpose of this standard is to specify defaults and profiles that enable the transport of time-sensitive fronthaul streams in Ethernet bridged networks.

1.3 Introduction

Fronthaul provides connectivity between functional blocks of a cellular base station (BS). The fronthaul flows between these functional blocks have stringent quality of service requirements. The successful support of fronthaul flows in a bridged network requires the selection of specific features and options that are specified in a number of different standards, some developed by IEEE Project 802®, and others (in particular, those that relate to functionality in OSI layer 3 and above; ISO/IEC 7498:1994 [B11]) developed by other standards organizations.[2]

This standard selects features and options that support OSI layers 1 and 2 in bridges and end stations from the following specifications:

— Virtual Local Area Network (VLAN) Bridge specification in IEEE Std 802.1Q™.[3]
— MAC service specifications in IEEE Std 802.1AC™.

[1]Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.
[2]The numbers in brackets correspond to those of the bibliography in Annex C
[3]Information on references can be found in Clause 2.

Copyright © 2018 IEEE. All rights reserved.
Documents
Document Sharing Hub
Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

— MAC/PHY technology specifications in IEEE Std 802.3™.
— Interspersing express traffic specification in IEEE Std 802.3br™.
— Frame preemption specification in IEEE Std 802.1Q.
— Time synchronization and Precision Time Protocol (PTP) specifications in IEEE Std 1588™.
— Telecom profile specification in ITU-T G.8275.1, which is based on IEEE Std 1588.
— Synchronous Ethernet specification in ITU-T G.8261, G.8262, and G.8264.

To specify and explain the selection of features and options, this standard:

a) Describes fronthaul requirements (Clause 6), specifying two classes of requirements (6.2, 6.3) that depend on the BS functional decomposition, and specifying synchronization requirements (6.4) that apply to both classes.
b) Describes how the operation of bridges and bridged networks affects the quality of service provided by the fronthaul bridged network (Clause 7), providing details to assist in the calculation of latency (7.1, 7.2, 7.3), the selection of network synchronization methods (7.4), and the potential impact of the use of flow control (7.5) and Energy Efficient Ethernet (EEE, 7.6).
c) Specifies two bridge profiles (Clause 8) that support the construction of bridged networks meeting fronthaul requirements. Profile A (8.1) is applicable to bridges that do not support frame preemption (7.3), while Profile B (8.2) involves frame preemption to accommodate larger non-fronthaul flows and frame sizes while preserving fronthaul traffic guarantees.
d) Discusses the applicability (Clause 9) of the synchronization methods described in 7.4 to the time synchronization categories defined in 6.4.1.
e) Defines fronthaul profile conformance requirements (Clause 5) for bridges meeting either Profile A or Profile B requirements, for end stations and for synchronization.
f) Provides a Profile Conformance Statement (PCS, Annex A) to support clear detailed statements of equipment conformance to fronthaul profile requirements.

Copyright © 2018 IEEE. All rights reserved.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

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.[4, 5]

IEEE Std 802.1AC™, IEEE Standard for Local and Metropolitan Area Networks—Media Access Control (MAC) Service Definition.

IEEE Std 802.1Q™, IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks.

IEEE Std 802.3™, IEEE Standard for Ethernet.

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

IEEE Std 1588™, IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems.

ITU-T G.8261, Timing and synchronization aspects in packet networks.[6]

ITU-T G.8262, Timing characteristics of a synchronous Ethernet equipment slave clock.

ITU-T G.8264, Distribution of timing information through packet networks.

ITU-T G.8271.1, Network limits for time synchronization in packet networks.

ITU-T G.8272, Timing characteristics of primary reference time clocks.

ITU-T G.8272.1, Timing characteristics of enhanced primary reference time clocks.

ITU-T G.8273.2, Timing characteristics of telecom boundary clocks and telecom time slave clocks.

ITU-T G.8273.3, Timing characteristics of telecom transparent clocks.

ITU-T G.8275.1, Precision time protocol telecom profile for phase/time synchronization with full timing support from the network.

MEF 10.3, Ethernet Services Attributes Phase 3.[7]

[4]IEEE publications are available from The Institute of Electrical and Electronics Engineers (http://standards.ieee.org/).
[5]The IEEE standards or products referred to in this clause are trademarks of The Institute of Electrical and Electronics Engineers, Inc.
[6]ITU-T publications are available from the International Telecommunications Union (http://www.itu.int/).
[7]MEF technical specifications are available from the MEF Forum (https://www.mef.net/).

Copyright © 2018 IEEE. All rights reserved.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

3. Definitions

For the purposes of this document, the following terms and definitions apply. *The IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.[8]

This standard makes use of the following terms defined in IEEE Std 802:

— bridge
— end station
— Ethernet
— forwarding
— frame
— Local Area Network (LAN)

This standard makes use of the following terms defined in IEEE Std 802.1Q:

— bridged network
— latency
— port
— priority-tagged frame
— traffic class
— untagged frame
— Virtual Local Area Network (VLAN)
— VLAN Bridge
— VLAN-tagged frame

The following terms are specific to this standard:

Category: An identifier of time synchronization requirements.[9]

NOTE—See 6.4.1.

Class: A collective term for fronthaul interfaces that applies a particular functional decomposition of a cellular base station and a particular treatment of fronthaul information flows.

NOTE—See 6.2 and 6.3.

fronthaul: The connectivity between the functional blocks (e.g., baseband processing and radio frequency blocks) of a cellular base station.

periodic: Repeating continuously, with a constant time (the period) between each occurrence.

Synchronous Ethernet: A method to distribute frequency synchronization over the Ethernet physical layer according to IEEE Std 802.3 and ITU-T Recommendations G.8261, G.8262, G.8264.[10]

time window: A time interval (among back-to-back time intervals of the same duration), within which packets of a specified flow can be sent.

[8]IEEE Standards Dictionary Online is available at: http://dictionary.ieee.org.

[9]The Categories used in this standard are defined by the Requirements for the eCPRI Transport Network [B6].

[10]Synchronous Ethernet has been defined to be fully conformant to IEEE Std 802.3, as documented in the relevant ITU-T Recommendations G.8261, G.8262, G.8264.

Copyright © 2018 IEEE. All rights reserved.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019

4. Acronyms and abbreviations

3GPP	3rd Generation Partnership Project
BC	boundary clock
BS	base station
C&M	Control and Management
CBR	Constant Bit Rate
CPRI	Common Public Radio Interface
CRC	Cyclic Redundancy Check
cTE	constant Time Error
C-VLAN	Customer VLAN
dTE	dynamic Time Error
eRE	eCPRI Radio Equipment[11]
eREC	eCPRI Radio Equipment Control
EEE	Energy Efficient Ethernet
EISS	Enhanced Internal Sublayer Service
ESMC	Ethernet Synchronization Messaging Channel
E-UTRA	Evolved Universal Terrestrial Radio Access
FID	Filtering Identifier
FLR	Frame Loss Ratio
GM	Grandmaster
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HPF	High Priority Fronthaul
IET	Interspersing Express Traffic
IPG	Inter Packet Gap
IQ	In-phase and Quadrature modulation
ISS	Internal Sublayer Service
LAN	Local Area Network
LPF	Low Priority Fronthaul
LPI	Low Power Idle
MAC	Medium Access Control

[11] eCPRI is a not an acronym; eCPRI is specified by the eCPRI Interface Specification [B5].

Copyright © 2018 IEEE. All rights reserved.

Documents
Document Sharing Hub

Full document details: BS ISO/IEC/IEEE 8802-1CM:2019