

INTERNATIONAL  
STANDARD

ISO/IEC/  
IEEE  
8802-21-1

First edition  
2018-04

---

---

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

**Part 21-1:  
Media independent services**

*Technologies de l'information — Télécommunications et échange  
d'information entre systèmes — Réseaux locaux et métropolitains —  
Partie 21-1: Services indépendants des supports*



Reference number  
ISO/IEC/IEEE 8802-21-1:2018(E)

© IEEE 2017



## COPYRIGHT PROTECTED DOCUMENT

© IEEE 2017

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

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

Published in Switzerland

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

Email: [stds.ipr@ieee.org](mailto:stds.ipr@ieee.org)  
Website: [www.ieee.org](http://www.ieee.org)

## Foreword

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

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

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](http://www.iso.org/patents)).

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

For an explanation on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

ISO/IEC/IEEE 8802-21-1 was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE Std 802.21.1-2017) and drafted in accordance with its editorial rules. It was adopted under the “fast-track procedure” defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee 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.

[This is a preview - click here to buy the full publication](#)

[This is a preview - click here to buy the full publication](#)

IEEE Std 802.21.1™-2017

# IEEE Standard for Local and metropolitan area networks— Part 21.1: Media Independent Services

Sponsor

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

Approved 14 February 2017

**IEEE-SA Standards Board**

**Abstract:** Several use cases and services are defined, namely, handover between heterogeneous networks, home energy management system, software-defined radio access networks (SDRANs), radio resource management (RRM), and device-to-device (D2D) communication service that need to be implemented in conjunction with the media independent services (MIS) framework as specified in IEEE Std 802.21™-2017.

**Keywords:** home energy management system, IEEE 802®, IEEE 802.21™, IEEE 802.21.1™, media independent handover, media independent service, mobile node, mobility, network-assisted device-to-device communication, point of attachment, point of services, radio resource management, seamless, software-defined radio access network, use case

---

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

Copyright © 2017 by The Institute of Electrical and Electronics Engineers, Inc.  
All rights reserved. Published 7 April 2017. Printed in the United States of America.

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

3GPP, UMTS, LTE are trademarks of The European Telecommunications Standards Institute (ETSI).

Bluetooth is a registered trademark of the Bluetooth SIG.

cdma2000 is a registered trademark of the Telecommunications Industry Association (TIA-USA) in the United States.

W3C is a trademark (registered in numerous countries) of the World Wide Web Consortium; marks of W3C are registered and held by its host institutions MIT, ERCIM, Keio, and Beihang.

Wi-Fi and Wi-Fi Direct are registered trademarks of the Wi-Fi Alliance.

WiMAX and WiMAX Forum are trademarks or registered trademarks of the WiMAX Forum.

PDF: ISBN 978-1-5044-3706-6      STD22402  
Print: ISBN 978-1-5044-3707-3      STDPD22402

*IEEE prohibits discrimination, harassment, and bullying.*

*For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.*

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

## Important Notices and Disclaimers Concerning IEEE Standards Documents

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

## 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 Xplore at <http://ieeexplore.ieee.org/> or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

## Errata

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.

## Participants

During development of this IEEE standard, the Media Independent Handover Services Working Group had the following officers:

**Subir Das, Chair**  
**Hyeong Ho Lee, Vice Chair**  
**Yoshikazu Hanatani, Technical Editor**

At the time this IEEE standard was completed, the 802.21.1 Task Group had the following membership:

**Subir Das, Chair**  
**Hyeong Ho Lee, Technical Editor**

H. Anthony Chan  
 Clint Chaplin  
 Lidong Chen  
 Jin Seek Choi  
 Daniel Corujo  
 Antonio De la Oliva Delgado

Yoshikazu Hanatani  
 Yong-Geun Hong  
 Sangkwon Peter Jeong  
 Farrokh Khatibi  
 Michael Lynch  
 Yoshihiro Ohba

Hyunho Park  
 Charles E. Perkins  
 Karen Randall  
 Yusuke Shimizu  
 Tomoki Takazoe  
 Yuji Unagami

In addition, the following members have either contributed or participated during the development of this standard:

Yusuke Doi  
 Krzysztof Grochla  
 Keiichi Teramoto

Torleiv Maseng  
 Yoichi Masuda  
 Christian Niephaus  
 Naoki Ogura

Dick Roy  
 Ruben Salazar  
 Randy Turner

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  
 William Byrd  
 Juan Carreon  
 Charles Cook  
 Daniel Corujo  
 Subir Das  
 Sourav Dutta  
 Richard Edgar  
 Marc Emmelmann  
 Avraham Freedman  
 Joel Goergen  
 Randall Groves  
 Yoshikazu Hanatani  
 Werner Hoelzl  
 David Howard  
 Noriyuki Ikeuchi

Atsushi Ito  
 Raj Jain  
 Piotr Karocki  
 Stuart Kerry  
 Farrokh Khatibi  
 Yongbum Kim  
 Thomas Kurihara  
 Hyeong Ho Lee  
 Jae Seung Lee  
 Moon-Sik Lee  
 Michael Lynch  
 Elvis Maculuba  
 Stephen McCann  
 Michael McInnis  
 Nick S. A. Nikjoo  
 Paul Nikolich  
 Satoshi Oyama

Arumugam Paventhan  
 Venkatesha Prasad  
 Karen Randall  
 Maximilian Riegel  
 Naotaka Sato  
 Yusuke Shimizu  
 Dorothy Stanley  
 Thomas Starai  
 Michael Stelts  
 Walter Struppler  
 Mark Sturza  
 Tomoki Takazoe  
 Patricia Thaler  
 Mark-Rene Uchida  
 Dmitri Varsanofiev  
 Prabodh Varshney  
 Oren Yuen

When the IEEE-SA Standards Board approved this standard on 14 February 2017, it had the following membership:

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

Chuck Adams  
Masayuki Ariyoshi  
Ted Burse  
Stephen Dukes  
Doug Edwards  
J. Travis Griffith  
Gary Hoffman

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

## Introduction

This introduction is not part of IEEE Std 802.21.1-2017, IEEE Standard for Local and metropolitan area networks—Part 21.1: Media Independent Services.

This standard defines several use cases and services, namely, handover between heterogeneous networks, home energy management system (HEMS), software-defined radio access networks (SDRANs), radio resource management (RRM), and device-to-device (D2D) communication service that need to be implemented in conjunction with the media independent services (MIS) framework as specified in IEEE Std 802.21-2017.

## Contents

1. Overview .....	11
1.1 Scope .....	11
1.2 Purpose .....	11
1.3 General .....	11
1.4 Assumptions .....	12
1.5 Media independence .....	12
2. Normative references.....	13
3. Definitions .....	14
4. Acronyms and abbreviations .....	19
5. Media independent handover service .....	22
5.1 Introduction .....	22
5.2 General design principles .....	24
5.3 Deployment example and functional model for MIS services.....	24
5.4 Single-radio handover procedures .....	27
5.5 Proxy operations.....	28
5.6 Media independent event service.....	35
5.7 Media independent command service (MICS) .....	35
5.8 Media independent information service.....	37
5.9 Media dependent SAPs.....	38
5.10 MIS_LINK_SAP primitives .....	39
5.11 MIS_SAP primitive .....	43
5.12 MIS_NET_SAP primitive .....	84
5.13 MIS protocol messages.....	88
6. Media independent service for software-defined radio access networks.....	102
6.1 Introduction .....	102
6.2 Service scenarios and signaling flows .....	105
6.3 Service access points (SAPs) and primitives .....	110
6.4 MIS protocol messages.....	111
7. Media independent service for home energy management system.....	111
7.1 Introduction .....	111
7.2 Service scenarios and signaling flows .....	112
8. Media independent service for radio resource management.....	119
8.1 Introduction .....	119
8.2 Service scenarios and signaling flows .....	119
8.3 RRM service specific MIS_LINK_SAP primitives.....	136
8.4 RRM service specific MIS_SAP primitives .....	138
8.5 RRM service specific MIS protocol messages for command service.....	145
9. Media independent service for D2D communication .....	148
9.1 Introduction .....	148
9.2 Service scenarios and signaling flows .....	148
9.3 D2D service specific MIS_SAP primitives .....	159
9.4 D2D service specific MIS protocol messages .....	162

Annex A (informative) Bibliography .....	164
Annex B (informative) Handover procedures .....	167
Annex C (normative) Mapping MIS messages to reference points .....	180
Annex D (normative) Media specific mapping for SAPs .....	181
Annex E (normative) Data type definition .....	182
Annex F (normative) Information element identifiers .....	188
Annex G (normative) MIS protocol message code assignments .....	189
Annex H (normative) Protocol implementation conformance statement (PICS) proforma .....	192
Annex I (informative) Authentication and key distribution procedures .....	195
Annex J (informative) Mobile node’s network access identifier format .....	200
Annex K (informative) Network discovery for single-radio handover .....	201
Annex L (normative) Handover decision .....	204
Annex M (informative) Practical uses of proxy Information Server .....	206
Annex N (informative) Certificate revocation list guidelines .....	207

# IEEE Standard for Local and metropolitan area networks— Part 21.1: Media Independent Services

## 1. Overview

### 1.1 Scope

This standard defines several media independent services (MIS); handover, home energy management system (HEMS), software-defined radio access networks (SDRANs), radio resource management (RRM), and device-to-device (D2D) communication that shall be implemented in conjunction with the MIS framework as defined in IEEE Std 802.21™-2017 to optimize the performance of such services.

### 1.2 Purpose

The purpose of this standard is to describe the media independent use cases and services, and when implemented using the framework described in IEEE Std 802.21-2017, the user experience and management of mobile devices can be greatly improved. The services described in this specification are applicable for interworking between IEEE 802® networks and non IEEE 802 networks (e.g., cellular networks).

### 1.3 General

This standard describes the following use cases that can be independently implemented using the MIS framework (IEEE Std 802.21-2017), which improves the user experience of mobile devices and management of these devices by operators while mobile devices are either connected or interworking in a heterogeneous networking environment:

- Media independent handover service (Clause 5).
- Media independent service for software-defined radio access networks (SDRANs) (Clause 6).
- Media independent service for home energy management system (HEMS) (Clause 7).
- Media independent service for radio resource management (RRM) (Clause 8).
- Media independent service for device-to-device (D2D) communication (Clause 9).

The handover service use case provides link-layer intelligence and other related network information to upper layers to optimize handovers between heterogeneous networks. This includes media types specified by Third Generation (3G) Partnership Project (3GPP™), 3G Partnership Project 2 (3GPP2), both wired and wireless media in the IEEE 802 family of standards, and downlink-only (DO) media such as Digital Video

Broadcasting (DVB), Terrestrial Digital Multimedia Broadcasting (T-DMB), and Advanced Television Systems Committee—Mobile/Handheld (ATSC-M/H).<sup>1</sup> The use case addresses the support of handovers for both mobile and stationary users supporting both dual-radio and single-radio mode of operation. For mobile users, handovers can occur when wireless link conditions change due to the users' movement. For the stationary user, handovers become imminent when the surrounding network environment changes, making one network more attractive than another.

The SDRANs use case describes how the MIS framework is used to support the seamless handover in a software-defined radio access network (SDRAN) environment that includes both fronthaul and backhaul networks. The MIS framework enables operators to provide link-layer intelligence, allocate radio resources, and optimize handovers when a mobile device is switching between heterogeneous networks that are managed by a software-defined networking (SDN) controller.

The HEMS use case describes how MIS framework is used to control the devices in a home networking environment for energy management purpose. This use case leverages the media independent command service (MICS) framework and multicast group management capabilities as defined in IEEE Std 802.21-2017.

The RRM service use case describes how MIS framework is used to support resource management in heterogeneous networks. The MIS framework enables mobile node (MN) to monitor its link status (e.g., signal strength and data rate), communicate it to the network, and provide control to its physical layer and data link layers. Leveraging these capabilities, this use case describes how an operator controls and manages the radio resources (e.g., frequency and power) in a heterogeneous networking environment that uses various communication technologies and various frequency bands.

The D2D communication service use case describes how MIS framework is used to provide D2D communication service between MNs that are in close proximity. Using MIS framework, communication service providers and network operators help an MN to search for and connect to its peer when requested. The MN then discovers other MNs in close proximity and connects them using network assistance. Network operators save network resources by offloading data to D2D communication.

This standard also defines additional primitives and messages that are required to support the preceding use cases, which are not specified in IEEE Std 802.21-2017. The configuration and management parameters for all MIS are defined in a MIB, see Annex I of IEEE Std 802.21-2017.

## 1.4 Assumptions

The following assumptions apply during a single-radio handover for a device that has two or more radios:

- a) In a single-radio scenario, the mobile device transmits on only one radio at a time. The target radio shall not transmit while the source radio is transmitting.
- b) While the source radio is receiving, the target radio shall not transmit in a manner causing interference to the source radio receiver.
- c) Prior to handover completion, only the source radio link is used to carry data.

## 1.5 Media independence

This standard, in conjunction with IEEE Std 802.21-2017, is intended to provide a generic interface between higher layer protocol stack and existing media-specific link layers, such as those specified by 3GPP, 3GPP2, the IEEE 802 family of standards, and downlink-only media.

---

<sup>1</sup> 3GPP is a trademark of The European Telecommunications Standards Institute (ETSI).

IEEE Std 802.21.1-2017  
IEEE Standard for Local and metropolitan area networks—Part 21.1: Media Independent Services

The handover use case uses service access points (SAPs) and primitives that provide generic link-layer intelligence. Individual media-specific technologies thereafter need to enhance their media-specific SAPs and primitives to satisfy the generic abstractions of this standard. Suitable adaptations are required to existing lower layer [medium access control (MAC) layer and physical (PHY) layer] standards of different media-specific technologies such as IEEE Std 802.3™-2015, IEEE Std 802.11™-2012, IEEE Std 802.16™-2012, 3GPP, 3GPP2, and DVB to satisfy the requirements of generic link-layer intelligence identified by this standard.<sup>2</sup>

## 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 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 802.1Q™-2014, IEEE Standard for Local and metropolitan area networks—Bridges and Bridged Networks.<sup>3, 4</sup>

IEEE Std 802.3™-2015, IEEE Standard for Ethernet.

IEEE Std 802.11™-2012, IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications.

IEEE Std 802.16™-2012, IEEE Standard for Air Interface for Broadband Wireless Access Systems.

IEEE Std 802.21™-2017, IEEE Standard for Standard for Local and metropolitan area networks—Part 21: Media Independent Services Framework.

IETF RFC 3748 (2004-06), Extensible Authentication Protocol (EAP).<sup>5</sup>

IETF RFC 4140 (2005-08), Hierarchical Mobile IPv6 Mobility Management (HMIPv6).

IETF RFC 4857 (2007-06), Mobile IPv4 Regional Registration.

IETF RFC 4881 (2007-06), Low-Latency Handoffs in Mobile IPv4.

IETF RFC 5268 (2008-06), Mobile IPv6 Fast Handovers.

IETF RFC 5944 (2010-10), IP Mobility Support for IPv4, Revised.

IETF RFC 6275 (2011-07), Mobility Support in IPv6.

---

<sup>2</sup> Information on references can be found in Clause 2.

<sup>3</sup> IEEE publications are available from the Institute of Electrical and Electronics Engineers (<http://standards.ieee.org/>).

<sup>4</sup> The IEEE standards or products referred to in Clause 2 are trademarks owned by the Institute of Electrical and Electronics Engineers, Incorporated.

<sup>5</sup> IETF documents (i.e., RFCs) are available for download at <http://www.rfc-archive.org/>.