
**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**

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

*Partie 11: Spécifications pour le contrôle d'accès au support et la
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IEEE Std 802.11i™-2003 Edition
(Includes IEEE Std 802.11, 1999 Edition;
IEEE Std 802.11a.-1999; IEEE Std 802.11b.-1999;
IEEE Std 802.11b.-1999/Cor 1-2001; and IEEE Std 802.11d.-2001)

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

Sponsor
LAN/MAN Standards Committee
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Adopted as an International Standard by the
International Organization for Standardization
and by the
International Electrotechnical Commission



Abstract: The medium access control (MAC) and physical characteristics for wireless local area networks (LANs) are specified in this standard, which is part of a series of standards for local and metropolitan area networks. The medium access control unit in this standard is designed to support physical layer units as they may be adopted dependent on the availability of spectrum. This standard contains five physical layer units: four radio units, operating in the 2400–2500 MHz band and in the bands comprising 5.15–5.25 GHz, 5.25–5.35 GHz, and 5.725–5.825 GHz, and one baseband infrared (IR) unit. One radio unit employs the frequency-hopping spread spectrum (FHSS) technique, two employ the direct sequence spread spectrum (DSSS) technique, and another employs the orthogonal frequency division multiplexing (OFDM) technique.

Keywords: 2 GHz, 5 GHz, ad hoc network, high speed, infrared, international roaming, LAN, local area network, mobility, radio frequency, RF, wireless

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

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This second edition cancels and replaces the first edition (ISO/IEC 8802-11:1999), which has been technically revised. It also incorporates the amendment ISO/IEC 8802-11:1999/Amd.1:2000.

ISO/IEC 8802 consists of the following parts, under the general title *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements*:

- *Part 1: Overview of Local Area Network Standards* [Technical Report]
- *Part 2: Logical link control*
- *Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*
- *Part 5: Token ring access method and physical layer specifications*
- *Part 6: Distributed Queue Dual Bus (DQDB) access method and physical layer specifications*
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Introduction

This introduction is not part of IEEE Std 802.11i, 2003 Edition, 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 802.11, 2003 Edition

IEEE Std 802.11, 2003 Edition, incorporates IEEE Std 802.11, 1999 Edition; IEEE Std 802.11a-1999; IEEE Std 802.11b-1999; IEEE Std 802.11b-1999/Cor 1-2001; and IEEE Std 802.11d-2001. Minor changes have been made throughout the document.

This standard defines the protocol and compatible interconnection of data communication equipment via the air, radio or infrared (IR), in a local area network (LAN) using the carrier sense multiple access protocol with collision avoidance (CSMA/CA) medium sharing mechanism. The medium access control (MAC) supports operation under control of an access point (AP) as well as between independent stations. The protocol includes authentication, association, and reassociation services, an optional encryption/decryption procedure, power management to reduce power consumption in mobile stations, and a point coordination function (PCF) for time-bounded transfer of data. The standard includes the definition of the management information base (MIB) using Abstract Syntax Notation 1 (ASN.1) and specifies the MAC protocol in a formal way, using the Specification and Description Language (SDL). Both ASN.1 and SDL source code are distributed with this standard.

The IR implementation of the PHY supports 1 Mbit/s data rate with an optional 2 Mbit/s extension. The radio implementations of the PHY specify frequency-hopping spread spectrum (FHSS) supporting 1 Mbit/s and optional 2 Mbit/s data rates, direct sequence spread spectrum (DSSS) supporting both 1 Mbit/s and 2 Mbit/s data rates, complementary code key (CCK) supporting both 5.5 Mbit/s and 11 Mbit/s data rates, optional packet binary convolutional code (PBCC) supporting both 5.5 Mbit/s and 11 Mbit/s data rates, and orthogonal frequency division multiplexing (OFDM) supporting 6 Mbit/s, 12 Mbit/s, and 24 Mbit/s and optional data rates of 9 Mbit/s, 18 Mbit/s, 36 Mbit/s, and 54 Mbit/s.

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

Conformance test methodology

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

Participants

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Bob O'Hara, 802.11rev Task Group Chair and Technical Editor

George Fishel, Secretary

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Carl F. Andren
Kazuhiro Aoyagi
Phil Belanger
John Biddick
Simon Black
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Wesley Brodsky
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Ken Clements
Wim Diepstraten
Darrol Draper
Peter Ecclesine
Darwin Engwer
Jeff Fischer
Matthew Fischer
Michael Fischer
John Fisher
Motohiro Gochi
Tim Godfrey
Jan Haagh

Karl Hannestad
Robert Heile
Maarten Hoebe
Duane Hurne
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Donald C. Johnson
Nobuo Karaki
Isao Masaki
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Gene Miller
Akira Miura
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Cherry Tom
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Sarosh N. Vesuna
Nien C. Wei
Harry Worstell
Timothy M. Zimmerman
Jonathan M. Zweig
Jim Zyren

Major contributions to IEEE Std 802.11, 1999 Edition, were received from the following individuals:

Henri Moelard

Richard Ozer

Arnoud Zwemmer

The following members of the balloting committee voted on IEEE Std 802.11, 1999 Edition:

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Major contributions to the 1997 version were received from the following individuals:

Robert Achatz	Richard Lee	Richard Ozer
Ken Biba	Kerry Lynn	Thomas Phinney
Paul Eastman	Michael Masleid	Leon S. Scaldeferri*
Ed Geiger	John McKown	Jim Schuessler
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Stephen J. Shellhammer
Matthew B. Shoemake
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Gary Spiess
Satoru Toguchi
Cherry Tom
Mike Trompower
Tom Tsoulogiannis
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Ikuo Wakayama
Robert M. Ward, Jr.
Mark Webster
Leo Wilz
Harry R. Worstell
Lawrence W. Yonge, III
Chris Zegelin
Jonathan M. Zweig
James Zyren

The following members of the balloting committee voted on IEEE Std 802.11b-1999:

Carl F. Andren
Jack S. Andresen
Lek Ariyavitakul
David Bagby
Kevin M. Barry
John H. Cafarella
James T. Carlo
David E. Carlson
Linda T. Cheng
Thomas J. Dineen
Christos Douligeris
Peter Ecclesine

Richard Eckard
Philip H. Enslow
John Fakatselis
Jeffrey J. Fischer
Michael A. Fischer
Robert J. Gagliano
Gautam Garai
Alireza Ghazizahedi
Tim Godfrey
Patrick S. Gonia
Steven D. Gray
Chris G. Guy

Vic Hayes
Allen Heberling
Chris D. Heegard
Juha T. Heiskala
Raj Jain
A. Kamerman
Dean M. Kawaguchi
Stuart J. Kerry
Patrick Kinney
Daniel R. Krent
Walter Levy
Stanley Ling

Randolph S. Little
Roger B. Marks
Peter Martini
Richard McBride
Bennett Meyer
David S. Millman
Hiroshi Miyano
Warren Monroe
Masahiro Morikura
Shimon Muller
Peter A. Murphy
Paul Nikolich
Erwin R. Noble
Satoshi Obara
Robert O'Hara
Charles Oestereicher

Kazuhiro Okanoué
Roger Pandanda
Ronald C. Petersen
Al Petrick
Vikram Punj
Pete Rautenberg
Stanley A. Reible
Edouard Y. Rocher
Kent G. Rollins
James W. Romlein
Floyd E. Ross
Christoph Ruland
Anil K. Sanwalka
Norman Schneidewind
James E. Schuessler
Rich Seifert
Matthew B. Shoemake

Leo Sintonen
Hitoshi Takanashi
Mike Trompower
Mark-Rene Uchida
Scott A. Valcourt
Richard Van Nee
Sarosh N. Vesuna
John Viaplana
Hirohisa Wakai
Robert M. Ward, Jr.
Mark Webster
Harry R. Worstell
Stefan M. Wurster
Oren Yuen
Jonathan M. Zweig
James Zyren

At the time the draft of IEEE Std 802.11b-1999/Cor 1-2001 was sent to sponsor ballot, the IEEE 802.11 Working Group had the following voting members:

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Al Petrick and **Harry Worstell**, *Vice Chairs*
Tim Godfrey, *Secretary*

Vic Hayes, *Parliamentarian*

Carl F. Andren, *new Chair Task Group b-corrigendum 1*
Victoria M. Poncini, *original Chair Task Group b-corrigendum 1*
Bob O'Hara, *Parliamentarian and Chair Task Group d*

John Fakatselis, *Chair Task Group e* **David Bagby**, *Chair Task Group f*

Jeff Abramowitz
Reza Ahy
Matthew Alspaugh
Keith B. Amundsen
Carl F. Andren
James R. Baker
Kevin M. Barry
Phil Belanger
Simon Black
Jan Boer
Ronald Brockmann
Naftali Chayat
W.C. Chen
Ken Clements
Peter Ecclesine
Richard Eckard
Darwin Engwer
Greg Ennis
Michael Fischer
George Fishel
John Fisher
Amar Ghorl
Ian Gifford
Steven D. Gray
Kei Hara
Allen Heberling
Chris Heegard

Robert Heile
Juha Heiskala
Maarten Hoebein
Robert Y. Huang
Masataka Izuka
Masayuki Ikeda
Donald C. Johnson
Tal Kaitz
Kevin Karcz
Mika Kasslin
Dean M. Kawaguchi
Jamshid Khun-Jush
Patrick Kinney
Duncan Kitchin
Steven Knudsen
John M. Kowalski
Bruce P. Kraemer
Denis Kuwahara
David S. Landeta
Changoo Lee
James S. Li
Stanley Ling
André Martin
Michael D. McInnis
Reiner Mim
Akira Miura
Masahiro Morikura
Peter Murray

Ravi P. Nalamati
Richard van Nee
Erwin R. Noble
Tomoki Ohsawa
Kazuhiro Okanoué
Richard H. Paine
Gregory Parks
Ivan Reede
Stanley A. Reible
Carlos A. Rios
Kent G. Rollins
Anil K. Sanwalka
Matthew B. Shoemake
Thomas Siep
David Skellern
Donald I. Sloan
Gary Spiess
Hitoshi Takanashi
Steve M. Thatcher
Satoru Toguchi
Cherry Tom
Chih C. Tsien
Tom Tsoulogiannis
Robert M. Ward Jr.
Alan Winskowski
Chris Zegelin
Jim Zyren

The following members of the balloting committee voted on IEEE Std 802.11b-1999/Cor 1-2001. Balloters may have voted for approval, disapproval, or abstention.

Matthew D. Alspaugh	Simon Harrison	Ronald C. Petersen
Lek Ariyavitakul	Ulrich Hartmann	Al Petrick
William E. Ayen	Vic Hayes	Brian D. Petry
Kevin Barry	Allen Heberling	Vikram Punj
Jan Boer	Raj Jain	Andris Putnins
Wesley Brodsky	A. Kamerman	Stanley A. Reible
James T. Carlo	Stuart J. Kerry	Gary S. Robinson
Keith Chow	Randolph S. Little	James W. Romlein
William C. Crosswy	James S. Marin	Floyd E. Ross
Thomas J. Dineen	Peter Martini	Jaideep Roy
Christos Douligeris	Richard McBride	Anil K. Sanwalka
Peter Ecclesine	Warren Monroe	Matthew B. Shoemake
Richard Eckard	Masahiro Morikura	Mark-Rene Uchida
Philip H. Enslow	Robert Mortonson	Scott A. Valcourt
John W. Fendrich	Wayne D. Moyers	Emmanuel Van Lil
Kurt B. Fischer	Erwin Noble	Paul A. Willis
Michael A. Fischer	Ellis S. Nolley	Stefan M. Wurster
Gautam Garai	Roger Pandanda	Wei Zhang
Tim Godfrey	Kenneth L. Peirce	Jonathan M. Zweig

At the time the draft of IEEE Std 802.11d-2001 was sent to sponsor ballot, the IEEE 802.11™ Working Group had the following voting members:

Stuart J. Kerry, Chair **Al Petrick and Harry Worstell, Vice-Chairs**

Tim Godfrey, Secretary

Bob O'Hara, Chair Task Group d and Technical Editor, 802.11d

John Fakatselis, Chair Task Group e

Michael Fischer, Technical Editor, 802.11e

Dave Bagby, Chair Task Group f

Bob O'Hara, Technical Editor, 802.11f

Matthew Shoemake, Chair Task Group g

James Allen	David Halasz	Bruce P. Kraemer
Matthew Alspaugh	Christopher J. Hansen	Denis Kuwahara
Keith Amann	Kei Hara	Jerry Loraine
Keith B. Amundsen	Victor Hayes	André Martin
Carl F. Andren	Allen Heberling	Bill McFarland
Jay Bain	Chris Heegard	Daniel R. McGlynn
Kevin M. Barry	Robert Heile	Michael D. McInnis
Jan Boer	Juha Heiskala	Reiner Mim
Ronald Brockmann	Jin-Meng Ho	Masahiro Morikura
Colum Caldwell	Maarten Hoeben	Peter Murray
Naftali Chayat	Frank P. Howley, Jr.	Ravi P. Nalamati
W. C. Chen	Robert Y. Huang	Erwin R. Noble
Sunghyun Choi	Masataka Iizuka	Tomoki Ohsawa
Ken Clements	Masayuki Ikeda	Kazuhiro Okanoue
Wm. Caldwell Crosswy	Donald C. Johnson	Richard H. Paine
Wim Diepstraten	Tal Kaitz	Gregory Parks
Peter Ecclesine	Kevin Karcz	Victoria M. Poncini
Richard Eckard	Mika Kasslin	Anand R. Prasad
Greg Ennis	Jamshid Khun-Jush	Ivan Reede
Amar Ghori	Ryoji Kido	Stanley A. Reible
Ian Gifford	Ken Kimura	Carlos A. Rios
Steven D. Gray	Etsuzo Kimura	Gunnar Rydnell
Evan Green	Duncan Kitchin	Anil K. Sanwalka
Rajugopal Gubbi	John M. Kowalski	Sid Schrum

Thomas Siep
David Skellern
Donald I. Sloan
Gary Spiess
Hitoshi Takanashi
Carl Temme
Steve M. Thatcher

Satoru Toguchi
Mike Trompower
Chih C. Tsien
Tom Tsoulogiannis
Jesse R. Walker
Robert M. Ward Jr.
Menzo Wentink

Steven D. Williams
Alan Winkowski
Hidehiro Yamashita
Wen-Ping Ying
Albert Young
Chris Zegelin
Jim Zyren

Major contributions to IEEE Std 802.11d-2001 were received from the following individuals:

Ken Clements
Darwin A. Engwer

Chris Zegelin

Johnny Zweig
Arnoud Zwemmer

The following members of the balloting committee voted on IEEE Std 802.11d-2001. Balloters may have voted for approval, disapproval, or abstention.

Carl F. Andren
Jack S. Andresen
Kevin M. Barry
Jan Boer
James T. Carlo
Keith Chow
Guru Dutt Dhingra
Muhammad Dhodhi
Thomas J. Dineen
Mary A. DuVal
Edward A. Dunlop
Sourav K. Dutta
Peter Ecclesine
Darwin A. Engwer
John W. Fendrich
Michael A. Fischer
Gautam Garai
Patrick S. Gonia

Julio Gonzalez-Sanz
Chris G. Guy
Simon Harrison
Victor Hayes
Bob J. Hughes
James Ivers
Raj Jain
Jacob W. Joergensen
A. Kamerman
Stuart I. Kerry
Randolph S. Little
Gregory Luri
James S. Marin
Peter Martini
Mobolaji Martins
Richard McBride
Bennett Meyer
Robert Mortonson
Wayne D. Moyers

Paul Nikolich
Erwin R. Noble
Bob O'Hara
Roger Pandanda
Vikram Punj
Gary S. Robinson
James W. Romlein
Doug Rosener
Robert Russell
Chaim Shenhav
Jerry A. Thrasher
Polychronis D. Tzerefos
Mark-Rene Uchida
Scott A. Valcourt
John Viaplana
Paul A. Willis
Forrest D. Wright
Oren Yuen

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**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**

1. Overview

1.1 Scope

The scope of this standard is to develop a medium access control (MAC) and physical layer (PHY) specification for wireless connectivity for fixed, portable, and moving stations within a local area.

1.2 Purpose

The purpose of this standard is to provide wireless connectivity to automatic machinery, equipment, or stations that require rapid deployment, which may be portable or hand-held, or which may be mounted on moving vehicles within a local area. This standard also offers regulatory bodies a means of standardizing access to one or more frequency bands for the purpose of local area communication.

Specifically, this standard

- Describes the functions and services required by an IEEE 802.11™-compliant device to operate within ad hoc and infrastructure networks as well as the aspects of station mobility (transition) within those networks.
- Defines the MAC procedures to support the asynchronous MAC service data unit (MSDU) delivery services.
- Defines several PHY signaling techniques and interface functions that are controlled by the IEEE 802.11 MAC.
- Permits the operation of an IEEE 802.11-conformant device within a wireless local area network (LAN) that may coexist with multiple overlapping IEEE 802.11 wireless LANs.
- Describes the requirements and procedures to provide privacy of user information being transferred over the wireless medium (WM) and authentication of IEEE 802.11-conformant devices.

2. Normative references

The following standards contain provisions which, through references in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

IEEE Std 802[®]-1990,¹ IEEE Standards for Local and Metropolitan Area Networks: Overview and Architecture.^{2 3}

IEEE Std C95.1[™]-1991 (Reaff 1997), IEEE Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

ISO/IEC 3166-1:1997, Codes for the representation of names of countries and their subdivisions—Part 1: Country codes.⁴

ISO/IEC 7498-1:1994, Information technology—Open Systems Interconnection—Basic Reference Model: The Basic Model.

ISO/IEC 8802-2:1998, Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 2: Logical link control.

ISO/IEC 8824-1:1995, Information technology—Abstract Syntax Notation One (ASN.1): Specification of basic notation.

ISO/IEC 8824-2:1995, Information technology—Abstract Syntax Notation One (ASN.1): Information object specification.

ISO/IEC 8824-3:1995, Information technology—Abstract Syntax Notation One (ASN.1): Constraint specification.

ISO/IEC 8824-4:1995, Information technology—Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications.

ISO/IEC 8825-1:1995, Information technology—ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER).

ISO/IEC 8825-2:1996, Information technology—ASN.1 encoding rules: Specification of Packed Encoding Rules (PER).

ISO/IEC 15802-1:1995, Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Common specifications—Part 1: Medium Access Control (MAC) service definition.

ITU Radio Regulations, volumes 1–4.⁵

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⁴ISO and ISO/IEC publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembe, CH-1211, Genève 20, Switzerland/Suisse (<http://www.iso.ch/>). They are also available in the United States from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA (<http://www.ansi.org/>).

⁵ITU-T publications are available from the International Telecommunications Union, Place des Nations, CH-1211, Geneva 20, Switzerland/Suisse (<http://www.itu.int/>).

ITU-T Recommendation X.210 (11/93), Information technology—Open systems interconnection—Basic Reference Model: Conventions for the definition of OSI services (*common text with ISO/IEC*).

ITU-T Recommendation Z.100 (03/93), CCITT specification and description language (SDL).

ITU-T Recommendation Z.105 (03/95), SDL combined with ASN.1 (SDL/ASN.1).

Withdrawn