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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

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

Partie 11: Spécifications du contrôle d'accès du milieu sans fil (MAC) et de la couche physique (PHY)

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This first edition of ISO/IEC/IEEE 8802-11 cancels and replaces ISO/IEC 8802-11:2005, which has been technically revised. It also incorporates the Amendments ISO/IEC 8802-11:2005/Amd.4:2006, ISO/IEC 8802-11:2005/Amd.5:2006 and ISO/IEC 8802-11:2005/Amd.6:2006.

ISO/IEC/IEEE 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 11: Wireless LAN medium access control (MAC) and physical layer (PHY) specifications*

— *Part 15-4: Wireless medium access control (MAC) and physical layer (PHY) specifications for low-rate wireless personal area networks (WPANs)*

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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

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29 March 2012

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IEEE Standard for Information technology—
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Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

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Approved 6 February 2012

IEEE-SA Standards Board

Abstract: This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 to 10 published in 2008 to 2011.
Keywords: 2.4 GHz, 3650 MHz, 4.9 GHz, 5 GHz, 5.9 GHz, advanced encryption standard, AES, carrier sense multiple access/collision avoidance, CCMP, channel switching, Counter mode with Cipher-block chaining Message authentication code Protocol, confidentiality, CSMA/CA, DFS, direct link, dynamic frequency selection, E911, emergency alert system, emergency services, forwarding, generic advertisement service, high throughput, IEEE 802.11, interface, international roaming, interworking, interworking with external networks, LAN, local area network, MAC, measurement, medium access control, media-independent handover, medium access controller, mesh, MIH, MIMO, MIMO-OFDM, multi-hop, multiple input multiple output, network advertisement, network discovery, network management, network selection, off-channel direct link, path-selection, PHY, physical layer, power saving, QoS, quality of service, PHY, physical layer, QoS mapping, radio, radio frequency, RF, radio resource, radio management, SSP, SSPN, subscriber service provider, temporal key integrity protocol, TKIP, TPC, transmit power control, tunneled direct link setup, wireless access in vehicular environments, wireless LAN, wireless local area network, WLAN, wireless network management, zero-knowledge proof

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Introduction

This introduction is not part of IEEE Std 802.11-2012, IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area network—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications.

This revision gives users, in one document, the IEEE 802.11 standard for wireless local area networks (WLANS) with all the amendments that have been published to date.

Incorporating published amendments

The original standard was published in 1999 and reaffirmed in 2003. A revision was published in 2007, which incorporated into the 1999 edition the following amendments: IEEE Std 802.11a™-1999, IEEE Std 802.11b™-1999, IEEE Std 802.11b-1999/Corrigendum 1-2001, IEEE Std 802.11d™-2001, IEEE Std 802.11g™-2003, IEEE Std 802.11h™-2003, IEEE Std 802.11i™-2004, IEEE Std 802.11j™-2004 and IEEE Std 802.11e™-2005.

The current revision, IEEE Std 802.11-2012, incorporates the following amendments into the 2007 revision:

— IEEE Std 802.11k™-2008: Radio Resource Measurement of Wireless LANs (Amendment 1)

— IEEE Std 802.11r™-2008: Fast Basic Service Set (BSS) Transition (Amendment 2)

— IEEE Std 802.11y™-2008: 3650–3700 MHz Operation in USA (Amendment 3)

— IEEE Std 802.11w™-2009: Protected Management Frames (Amendment 4)

— IEEE Std 802.11n™-2009: Enhancements for Higher Throughput (Amendment 5)

— IEEE Std 802.11p™-2010: Wireless Access in Vehicular Environments (Amendment 6)

— IEEE Std 802.11z™-2010: Extensions to Direct-Link Setup (DLS) (Amendment 7)

— IEEE Std 802.11v™-2011: IEEE 802.11 Wireless Network Management (Amendment 8)

— IEEE Std 802.11u™-2011: Interworking with External Networks (Amendment 9)

— IEEE Std 802.11s™-2011: Mesh Networking (Amendment 10)

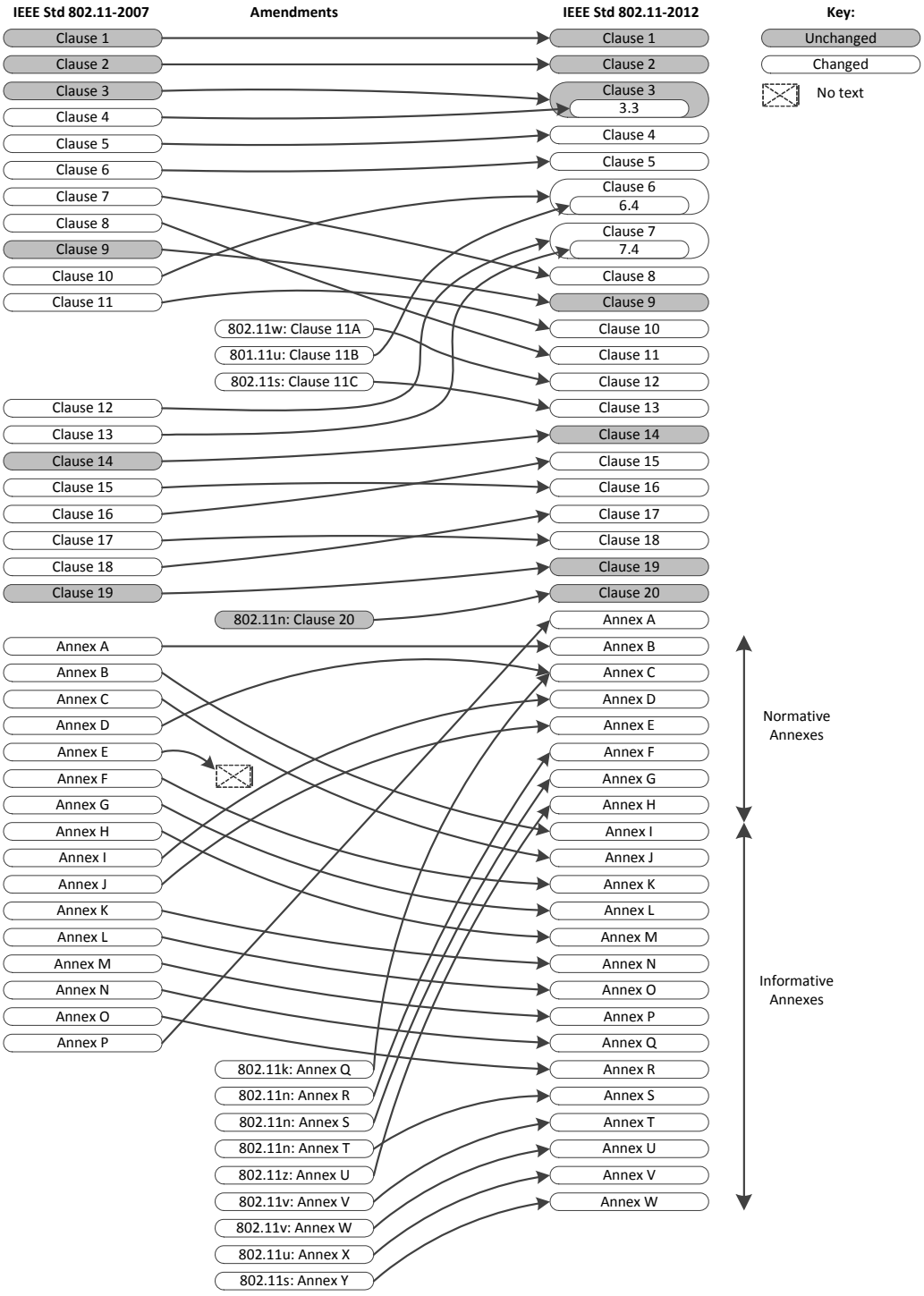
As a result of publishing this revision, all of the previously published amendments and revisions are now retired.

Technical corrections, clarifications, and enhancements

In addition, this revision specifies technical corrections and clarifications to IEEE Std 802.11 as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. Such enhancements include incorporated interpretation requests.

Revised clause and annex numbering

In IEEE Std 802.11-2012, the order of clauses and annexes has also been revised. The result of this revised order on the numbering of clauses and annexes is summarized in Figure A.



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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 define one medium access control (MAC) and several physical layer (PHY) specifications for wireless connectivity for fixed, portable, and moving stations (STAs) within a local area.

1.2 Purpose

The purpose of this standard is to provide wireless connectivity for fixed, portable, and moving stations 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.

1.3 Supplementary information on purpose

Specifically, this standard

- Describes the functions and services required by an IEEE 802.11™-compliant device to operate within independent and infrastructure networks as well as the aspects of STA mobility (transition) within those networks.
- Describes the functions and services that allow an IEEE 802.11-compliant device to communicate directly with another such device outside of an independent or infrastructure network.

— Defines the MAC procedures to support the 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 (WLAN) that may coexist with multiple overlapping IEEE 802.11 WLANs.
— Describes the requirements and procedures to provide data confidentiality of user information and MAC management information being transferred over the wireless medium (WM) and authentication of IEEE 802.11-conformant devices.
— Defines mechanisms for dynamic frequency selection (DFS) and transmit power control (TPC) that may be used to satisfy regulatory requirements for operation in any band.
— Defines the MAC procedures to support local area network (LAN) applications with quality-of-service (QoS) requirements, including the transport of voice, audio, and video.
— Defines mechanisms and services for wireless network management of STAs that include BSS transition management, channel usage and coexistence, collocated interference reporting, diagnostic, multicast diagnostic and event reporting, flexible multicast, efficient beacon mechanisms, proxy ARP advertisement, location, timing measurement, directed multicast, extended sleep modes, traffic filtering, and management notification.
— Defines functions and procedures aiding network discovery and selection by STAs, information transfer from external networks using QoS mapping, and a general mechanism for the provision of emergency services.
— Defines the MAC procedures that are necessary for wireless multi-hop communication to support wireless LAN mesh topologies.

1.4 Word Usage

In this document, the word *shall* is used to indicate a mandatory requirement. The word *should* is used to indicate a recommendation. The word *may* is used to indicate a permissible action. The word *can* is used for statements of possibility and capability.

2. Normative references

The following referenced documents are indispensable for the application of this standard (i.e., they must be understood and used; therefore, 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.

3GPP TS 24.234, 3GPP System to Wireless Local Area Network (WLAN) interworking; WLAN User Equipment (WLAN UE) to network protocols; Stage 3.[1]

ETSI EN 301 893, Broadband Radio Access Networks (BRAN); 5 GHz high performance RLAN; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive.[2]

FIPS PUB 180-3-2008, Secure Hash Standard.[3]

FIPS PUB 197-2001, Advanced Encryption Standard (AES).

[1]3GPP™ documents are available from the 3rd Generation Partnership Project Web site (http://www.3gpp.org).
[2]ETSI documents are available from the European Telecommunications Standards Institute (http://www.etsi.org).
[3]FIPS publications are available from the National Technical Information Service (NTIS) (http://www.ntis.org/).

FIPS SP800-38B, "Recommendation for Block Cipher Modes of Operation: The CMAC Mode for Authentication, Dworkin, M."

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IEEE Std 754™-2008, IEEE Standard for Binary Floating-Point Arithmetic.[4,5]

IEEE Std 802®-2001, IEEE Standards for Local and Metropolitan Area Networks: Overview and Architecture.

IEEE Std 802.1AS™, IEEE Standard for Local and Metropolitan Area Networks—Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks.

IEEE Std 802.1X™-2004, IEEE Standard for Local and Metropolitan Area Networks: Port-Based Network Access Control.

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IEEE Std C95.1™, IEEE Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

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[5]IEEE publications are available from The Institute of Electrical and Electronics Engineers (http://standards.ieee.org/).

[6]IETF documents (i.e., RFCs) are available for download at http://www.rfc-archive.org/.

IETF RFC 3629, UTF-8, a transformation format of ISO 10646, F. Yergeau, Nov. 2003.

IETF RFC 3748, Extensible Authentication Protocol (EAP), B. Aboba, L. Blunk, J. Vollbrecht, J. Carlson, H. Levkowetz, June 2004.

IETF RFC 3825, Dynamic Host Configuration Protocol Option for Coordinate-based Location Configuration Information, Polk, J., Schnizlein, J., Linsner, M., July 2004.

IETF RFC 3986, Uniform Resource Identifier (URI): Generic Syntax, Jan. 2005.

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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).

[7]ISO/IEC publications are available from the ISO Central Secretariat (http://www.iso.ch/). ISO/IEC publications are also available in the United States from the American National Standards Institute (http://www.ansi.org/).

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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.

ISO/IEC 15802-3, Information Technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Common specifications—Part 3: Media Access Control (MAC) Bridges.

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[8]The numbers in brackets correspond to the numbers of the bibliography in Annex A.

[9]ITU publications are available from the International Telecommunications Union (http://www.itu.int/).