IEEE P802.11
Wireless LANs

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| Isolating Clauses 16, 17, from 19 and 20  |
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Abstract

This document contains proposed changes to satisfy CIDs 3116, 3121, 3124

**CID 166**

Background

There have been several CIDs on the subject of making support of Clause 16 and 17 by clause 19 devices, optional. This proposal does not intend to deprecate Clause 16 and/or Clause 17. Instead this proposal is based on the idea of orthogonal definitions for the different PHYs and proposes text to separate them into independent functions.

Rationale

STAs and APs in the ISM 2.4 GHz band are commonly referred to as:

* 11b: a device supporting only Clause 16 (DSSS) and 17 (HR/DSSS)
* 11b/g: a device supporting Clause 16 and 17 as well as Clause 19 (ERP)
* 11b/g/n: a device supporting Clause 20 (HT) as well as Clause 19, and Clauses 16/17.

Note that the term “11b/g” is commonly used even though the specification for a device supporting Clause 19 mandates that the device must support Clause 16/17. Hence it could be called “11g” but that is not the case.

This proposal builds on the common terminology such that “11g” would mean “Clause 19 only”.

Hence, when referring to the PHY support of an 802.11 device, the common terminology would be 100% clear, 11g is OFDM only, 11b/g is OFDM/CCK/DSSS.

For the users, if they have a STA that is 11b, then it is clear they would need an AP that supports 11b, such as 11b, 11b/g, or 11b/g/n, and vice versa.

Many presentations and statements have been made on how the presence of 11b devices, the fallback procedures that drop to 11b rates and the beaconing and probing at 11b rates that are common solely because of the present mandatory link between 11g and 11b, have affected network throughputs. On the other hand there are legitimate needs for 11b to be supported in some applications. Labeling and certification is outside the scope of IEEE 802.11 but by clearly distinguishing between the PHYs and in particular the CCK/DSSS PHY and the OFDM PHYs, which are not directly interoperable, allows the market to decide on how to certify and label and also on how any changes may be phased in over time.

Note also that this proposal in no way deprecates or lessens the importance of 11b devices.

Also note that the full descriptions for the protection of 11b devices by 11g devices are maintained, and that the protection mechanism clause is mandated for mixed mode STAs.

In the situation where an 11g network is overlapping with a mixed mode 11b/g network, an 11g AP will not hear the 11b Beacons and the basic protection is ED-CCA. However, if the AP determines that there is interference, it may set the Protection Bit and in this case the non-AP STAs shall obey it. Therefore, the text includes that an 11g AP may set the Protection Bit and if set non-AP 11g STAs must obey.

Proposed Changes

19.1.1 General

*Replace*

“This clause specifies further rate extension of the PHY for the DSSS system of Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications) and the extensions of Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification). Hereinafter the PHY defined in this clause is known as the ERP. This PHY operates in the 2.4 GHz ISM band.”

*with*

 “Clause 19 (ERP specification) specifies the PHY entity for an extended rate orthogonal frequency division multiplexing (OFDM) system. This PHY operates in the 2.4 GHz ISM band.”

19.1.2 Introduction

*Replace*

“The ERP builds on the payload data rates of 1 and 2 Mb/s, as described in Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications), that use DSSS modulation and builds on the payload data rates of 1, 2, 5.5, and 11 Mb/s, as described in Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification), that use DSSS and CCK. The ERP draws from Clause 18 (Orthogonal frequency division multiplexing (OFDM) PHY specification) to provide additional payload data rates of 6, 9, 12, 18, 24, 36, 48, and 54 Mb/s. Of these rates, transmission and reception capability for 1, 2, 5.5, 6, 11, 12, and 24 Mb/s data rates is mandatory.”

*with*

The ERP draws from Clause 18 (Orthogonal frequency division multiplexing (OFDM) PHY specification) to provide payload data rates of 6, 9, 12, 18, 24, 36, 48, and 54 Mb/s. Of these rates, transmission and reception capability for 6, 12, and 24 Mb/s data rates is mandatory.

19.1.3 Operational Modes

*Changes as follows:*

The radio portion of all Clause 19 (Extended Rate PHY (ERP) specification)-compliant ERP systems implements all mandatory modes of Clause 18 (Orthogonal frequency division multiplexing (OFDM) PHY specification) except it uses the 2.4 GHz frequency band and channelization plan specified in 17.3.6 (PHY operating specifications, general)..

. The 2.4 GHz ISM band is a shared medium, and coexistence with other devices such as Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications) and Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification) might be an issue. If the ERP STA also supports Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications) or Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification), this coexistence may be achieved by several means, including virtual CS (RTS/CTS or CTS-to-self), CSMA/CA protocols, and MSDU fragmentation,. For example, a BSS could operate in an ERP-OFDM mode, a mixed mode of ERP-OFDM and ERP-DSSS/CCK, or a mixed mode of ERP-DSSS/CCK and NonERP..

A STA that supports the ERP PHY and also supports Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications) or Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification) shall support a mixed mode of ERP-OFDM and ERP-DSSS/CCK, or a mixed mode of ERP-DSSS/CCK as described in this clause, and shall use protection mechanism for non-ERP receivers as described in 9.26.2.

An AP that supports the ERP PHY and does not support Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications) or Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification) may set the Use\_Protection field of the ERP element equal to 1. An ERP STA shall use protection mechanisms (such as RTS/CTS or CTS-to-self) for ERP-OFDM MPDUs of type Data or an MMPDU when the Use\_Protection field of the ERP element is equal to 1 (see 9.26.2).

The changes to other parts of this standard required to implement mixed mode of ERP-OFDM and ERP-DSSS/CCK or a mixed mode of ERP-DSSS/CCK are summarized as follows:

a) ERP-DSSS/CCK

1) The PHY uses the capabilities of Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification) with the following exceptions:

i) Support of the short PPDU header format capability of 17.2.2.3 (Short PPDU format) is mandatory.

ii) CCA (see 17.3.8.5 (CCA)) has a mechanism that detects all mandatory Clause 19 (Extended Rate PHY (ERP) specification) sync symbols.

iii) The maximum input signal level (see 17.3.8.3 (Receiver maximum input level)) is –20dBm.

iv) Locking the transmit center frequency and the symbol clock frequency to the same reference oscillator is mandatory.

b) ERP-OFDM

1) The PHY uses the capabilities of Clause 18 (Orthogonal frequency division multiplexing (OFDM) PHY specification) with the following exceptions:

i) The frequency plan is in accordance with 17.3.6.2 (Operating frequency range) and 17.3.6.3 (Channel Numbering of operating channels) instead of 18.3.8.4 (Operating channel frequencies).

ii) CCA has a mechanism that detects all mandatory Clause 19 (Extended Rate PHY (ERP) specification) sync symbols.

iii) The frequency accuracy (see 18.3.9.5 (Transmit center frequency tolerance) and 18.3.9.6 (Symbol clock frequency tolerance)) is ±25 ppm.

iv) The maximum input signal level (see 18.3.10.5 (Receiver maximum input level)) is –20 dBm.

v) The value of the slot time is found in Table 19-6 (ERP characteristics).

vi) SIFS is 10 μs in accordance with 17.3.3 (DS PHY characteristics). See 19.3.2.4 (ERPOFDM PPDU format) for more detail.

19.1.5 ERP functions

*Changes as follows:*

The ERP contains two functional entities: the PHY function and the layer management function.

The ERP service is provided to the MAC through the PHY service primitives described in Clause 7 (PHY service specification). Interoperability is addressed by use of the CS mechanism specified in 9.3.2.1 (CS mechanism) and the protection mechanism in 9.26 (Protection mechanisms).

*Table 19-1 Make deletions as follows*:

DATARATE Delete ERP-DSSS: 1 and 2

 Delete ERP-CCK: 5.5 and 11

PREAMBLE\_TYPE Delete ERP-DSSS, ERP-CCK: SHORTPREAMBLE, LONGPREAMBLE

MODULATION Delete ERP-DSSS, ERP-CCK

*Table 19-3 Make deletions as follows*:

DATARATE Delete ERP-DSSS: 1 and 2

 Delete ERP-CCK: 5.5 and 11

PREAMBLE\_TYPE Delete ERP-DSSS, ERP-CCK: SHORTPREAMBLE, LONGPREAMBLE

MODULATION Delete ERP-DSSS, ERP-CCK

*Delete Clause 19.3.2.2 Long Preamble PPDU format*

*Delete Clause 19.3.2.3 Short preamble PPDU format*

*Delete Clause 19.3.3.1 Long and short preamble formats*

19.3.4 CCA

*Changes as follows:*

The PHY shall provide the capability to perform a CCA and report the results of the assessment to the MAC. The CCA mechanism shall detect that the medium is busy for the PHY PPDUs specified in 18.3.2 (PPDU format) The CCA mechanism performance requirements are given in 19.4.6 (CCA performance).

The ERP shall provide the capability to perform CCA according to the following method:

**CCA Mode** (ED and CS): A combination of CS and energy above threshold. CCA shall have a mechanism for CS that detects all mandatory Clause 19 (Extended Rate PHY (ERP) specification) sync symbols. CCA shall report busy at least while a PPDU with energy above the ED threshold is being received at the antenna.

A busy channel shall be indicated by a PHY-CCA.indication(BUSY) primitive. A clear channel shall be indicated by a PHY-CCA.indication(IDLE) primitive.

19.3.5 PHY receive procedure

*Changes as follows:*

This subclause describes the procedure used by receivers of the ERP. An ERP receiver shall be capable of receiving 6, 12, and 24 Mb/s using the modulation and preamble described in Clause 18 (Orthogonal frequency division multiplexing (OFDM) PHY specification). The PHY may also implement the ERPOFDM modulations at rates of 9, 18, 36, 48, and 54 Mb/s. The receiver shall be capable of detecting the preamble type (ERP-OFDM,) and the modulation type. These values shall be reported in the RXVECTOR (see 19.2 (PHY-specific service parameter list)).

9.26.2 Protection mechanism for non-ERP receivers

*Add at beginning:*

“This clause applies to Clause 19 ERP-OFDM STAs that also support Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications) or Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification) rates.

This clause also applies to Clause 19 ERP-OFDM STAs that do not support Clause 16 (DSSS PHY specification for the 2.4 GHz band designated for ISM applications) or Clause 17 (High rate direct sequence spread spectrum (HR/DSSS) PHY specification) rates when the Use\_Protection field of the ERP element is equal to 1.”