IEEE P802.11
Wireless LANs

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| ETSI BRAN Liaison re: Contention Window Updates |
| Date: 2019-10-21 |
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Abstract

This document contains a liaison received from ETSI BRAN on the topic of Contention Window Updates in EN 301 893. The received liaison is included below and reproduced on the following pages.



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| **Liaison Statement** |
| **Title:** | Contention Window Update in Initiating Device Channel Access Mechanism of EN 301 893 |
| Date: | 2019-10-10 |
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| **From** (source): | ETSI TC BRAN |
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| **Copy to:** |  |
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| Response to:(if applicable) |  |
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| Attachments: (if applicable) |  |
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**1. Overall description:**

The channel access mechanism for load based equipment as defined in clause 4.2.7.3.2 of EN 301 893 v2.1.1 relies heavily on proper management of the contention window (CW) size. This is to implement the principles of listen-before-talk with truncated exponential backoff. Updating the CW size in turn relies on feedback about success and failure of prior transmissions.

It was brought to the attention of ETSI TC BRAN that the current description of CW management in EN 301 893 v2.1.1 may not take into account all types of transmissions appropriately or may remain unclear on how to react on certain cases of transmission feedback. After thorough analysis of the concerns and intense discussions ETSI TC BRAN converged to the following text with regard to the Initiating Device Channel Access Mechanism and the CW update procedure contained therein.

<quote>

**4.2.7.3.2.6 Initiating Device Channel Access Mechanism**

Before a transmission or a burst of transmissions on a channel or combination channels, the *Initiating Device* shall operate at least one *Channel Access Engine* that executes the procedure described in step 1) to step 7) below. This *Channel Access Engine* makes use of the parameters defined in table 7 or table 8 in clause 4.2.7.3.2.4.

A single *Observation Slot* as defined in clause 3.1 and as referenced by the procedure in the present clause shall have a duration of not less than 9 µs.

An *Initiating Device* shall operate at least one and no more than four different *Channel Access Engines* each with a different *Priority Class* as definedin clause 4.2.7.3.2.4:

1. The *Channel Access Engine* shall set CW to CWmin.
2. The *Channel Access Engine* shall select a random number q from a uniform distribution over the range 0 to CW. Note 2 in table 7 defines an alternative range for q when the previous or next *Channel Occupancy Time* is greater than the maximum *Channel Occupancy Time* specified in table 7.
3. The *Channel Access Engine* shall initiate a *Prioritization Period* as described in step 3) a) to step 3) c):
4. The *Channel Access Engine* shall set p according to the *Priority Class* associated with this *Channel Access Engine*. See clause 4.2.7.3.2.4.
5. The *Channel Access Engine* shall wait for a period of 16 µs.
6. The *Channel Access Engine* shall perform a *Clear Channel Assessment (CCA)* on the channel*.* During a single *Observation Slot* the *Channel Access Engine* shall determine if the channel or combination of channels are *Occupied Channel(s)*:
7. For the channel(s) that have been detected as occupied, the *Channel Access Engine* shall initiate a new *Prioritization Period* starting with step 3) a) after the energy within the channel(s) has dropped below the *ED threshold* defined in clause 4.2.7.3.2.5.
8. For the channels that have been determined as *Unoccupied Channels*, p may be decremented by not more than 1. If p is equal to 0, the *Channel Access Engine* shall proceed with step 4), otherwise the *Channel Access Engine* shall proceed with step 3) c).
9. The *Chanel Access Engine* shall perform a *Backoff Procedure* as described in step 4) a) to step 4) d):
10. This step verifies if the *Channel Access Engine* satisfies the *Post Backoff* condition. If q < 0 and the *Channel Access Engine* is ready for a transmission, the *Channel Access Engine* shall set CW equal to CWmin and shall select a random number q from a uniform distribution over the range 0 to CW before proceeding with step 4) b). Note 2 in table 7 defines an alternative range for q when the previous or next *Channel Occupancy Time* is greater than the maximum *Channel Occupancy Time* specified in table 7.
11. If q < 1 the *Channel Access Engine* shall proceed with step 4) d). Otherwise, the *Channel Access Engine* may decrement the value q by not more than 1 and the *Channel Access Engine* shall proceed with step 4) c).
12. The *Channel Access Engine* shall perform a *Clear Channel Assessment (CCA)* on the channel. During a single *Observation Slot* the *Channel Access Engine* shall determine if the channel or combination of channels are *Occupied Channel(s)* or *Unoccupied Channel(s)*:
13. For the channel(s) that have been determined as *Occupied Channel(s)*, the *Channel Access Engine* shall continue with step 3).
14. For the channel(s) that have been detected as *Unoccupied Channel(s)*, the *Channel Access Engine* shall continue with step 4) b).
15. If the *Channel Access Engine* is ready for a transmission the *Channel Access Engine* shall continue with step 5). Otherwise, the *Channel Access Engine* shall decrement the value q by 1 and the *Channel Access Engine* shall proceed with step 4) c). It should be understood that q can become negative and keep decrementing as long as the *Channel Access Engine* is not ready for a transmission.
16. If only one *Channel Access Engine* of the *Initiating Device* is in this stage (see note 1) the *Channel Access Engine* shall proceed with step 6). If the *Initiating Device* has a multitude of *Channel Access Engines* in this stage (see note 2), the *Channel Access Engine* with highest *Priority Class* in this multitude shall proceed with step 6) and all other *Channel Access Engines* in the current stage shall proceed with step 7).

NOTE 1: This is equivalent to the equipment having no internal collision.

NOTE 2: This is equivalent to the equipment having one or more internal collisions.

1. The *Channel Access Engine* may start transmissions belonging to the corresponding or higher *Priority Classes*, on one or more channels. If the *Initiating Device* transmits in more than one channel, it shall comply with the requirements contained in clause 4.2.7.3.2.3:
2. The *Initiating Device* and its *Responding Devices* can have multiple transmissions without performing an additional CCA on the channel or combination of channels providing the gap in between such transmissions does not exceed 16 µs. Otherwise, if this gap exceeds 16 µs and does not exceed 25 µs, the *Initiating Device* may continue transmissions provided that for a duration of one *Observation Slot* the *Initiating Device* found the channel(s) to be *Unoccupied Channel(s)*.
3. The *Channel Access Engine* may grant [up to ten] authorizations to transmit on the current channel to each of one or more *Responding Devices*. If the *Initiating Device* issues such a transmission grant to a *Responding Device*, the *Responding Device* shall operate according to the procedure described in clause 4.2.7.3.2.7.
4. The *Initiating Device* may have simultaneous transmissions of *Priority Classes* lower than the *Priority Class* of the *Channel Access Engine,* provided that the corresponding transmission duration (*Channel Occupancy Time*) is not extended beyond the time that is needed for the transmission(s) corresponding to the *Priority Class* of the *Channel Access Engine*.
5. When the *Channel Occupancy* has completed, CW shall be updated as specified below, and the *Initiating Device* proceeds with step 2).

According to clause 4.2.7.3.2.4 where four different *Priority Classes* are defined, an *Initiating Device* shall operate only one *Channel Access Engine* for each *Priority Class* implemented.

CW may take values that are greater than the values of CW in step 1) to step 7).

Updating CW is based on feedback about the success or failure of *Channel Occupancies*.

Success and failure of a *Channel Occupancy* are defined as follows:

* a *Channel Occupancy* is a success when at least one transmission that started at the beginning of the *Channel Occupancy* was successful or when there is no intention to retransmit any part of the information transmitted during the *Channel Occupancy.*
* otherwise, the *Channel Occupancy* is a failure.

When CW is updated:

* if new feedback is available relative to the prior CW update, the feedback for the latest COT for which new feedback is received shall be used:
	+ if the feedback indicates success, CW shall be set to CWmin.
	+ if the feedback indicates failure, CW shall be set to min(CW×2 + 1, CWmax).
* otherwise, CW shall remain the same.

During normal operation, there [shall] be no bias towards success in the selection of the feedback used to update CW.

<unquote>

For your information the quoted text includes revision marks indicating changes from the last published version 2.1.1 of EN 301 893.

It is the current consensus within ETSI TC BRAN to include this text into the draft of the upcoming version of EN 301 893. If no further changes are accepted and after formal approval of the draft it will become part of the standard.

We encourage you to analyze the requirements on the CW update procedure (see yellow highlight) as stated in the text above with regard to their compatibility with the technologies specified by your respective organization. Specifically, we would like to draw your attention to the last sentence related to no bias in providing transmission feedback. We would appreciate if you would share the results of your analysis with us particularly if you discover any compatibility issues.

**2. Actions:**

The recipients of the LS are respectfully requested to take into account the provided information and to provide feedback to the originator where appropriate.

**3. Date of next meetings of the originator:**

BRAN #104, 02-06 Dec 2019, Sophia Antipolis

BRAN #105, 23-27 Mar 2020, Sophia Antipolis

**References:**