### IEEE P802.11 Wireless LANs

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| 11be D2.1.1 CR for indicating to operate in EML mode via PS-Poll or QoS Null frame | | | | |
| Date: 2022-07-21 | | | | |
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Abstract

This submission proposes resolutions for the following CID:

10125

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Add TWT case
* Rev 2: Based on Draft 2.1.1

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGbe D2.1.1 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe D2.1.1 Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGbe Editor: Editing instructions preceded by “TGbe Editor” are instructions to the TGbe editor to modify existing material in the TGbe draft. As a result of adopting the changes, the TGbe editor will execute the instructions rather than copy them to the TGbe Draft.***

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| **CID** | **Commenter** | **Clause** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 10125 | Xiangxin Gu | 35.3.17 | 462.56 | It's useful to have a mechanism for an EMLSR/EMLMR supporting non-AP MLD to enable EMLSR/EMLMR mode by PS-Poll or QoS Null frame after awaking from doze. | Define the mechanism to enable EMLSR/EMLMR mode by PS-Poll or QoS Null frame | **Revised:**  Agree with the commenter in principle.  When a STA affiliated with the EML mode enabled non-AP MLD awakes to retrieve the buffered BUs, it will send a PS-Poll frame or QoS Null frame to announce its awakeness. Propose to piggyback the intention to operate with all corresponding STAs awake or not during this awake period on the Reserved B14 of the Frame Control subfield of the PS-Poll frame or QoS Null frame.  Tgbe editor: please implement changes as shown in this doc tagged as 10125 |

**Discussion:**

**Scenario:**

A single radio non-AP MLD with 2 affiliated STA 1 and STA 2 setups link 1 and 2 respectively with an AP MLD. Both STA 1 and STA 2 support 2x2 MIMO and SMPS. The non-AP MLD supports EMLSR and has enabled EMLSR mode mode on link 1 and link 2.

There are 2 services running over the links. Service 1 has periodic traffic with large amount of data. Service 2 has aperiodic small data.

At the time STA 1 awaking from doze to retrieve BUs for service 1 based on its traffic periodicity. The non-AP MLD expects to work with both STA 1 and STA 2 awake to have data transferred ASAP.

At the time STA 1 awaking from doze to retrieve BUs not for service 1. The non-AP MLD expects to work with only STA 1 awake to save power with SMPS.

The non-AP MLD can not achieve the requirement above because the non-AP MLD could not swith the radio to STA 2 to send PS-Poll frame or QoS Null frame to announce its awakeness while STA 1 is awake, based on the behaviour of STA 1 and STA 2 after awake from doze specified in the standard (i.e. following the rules defined in 11.2.3.7 (Receive operation for STAs in PS mode) and 11.2.3.8 (Receive operation using APSD).

In order to have the non-AP MLD select to have both STA 1 and STA 2 awake or not while a STA awakes from doze based on the service going to happen, a light way is needed.

Similar need is there for EMLMR mode. The difference from EMLSR mode is that, if a STA affiliated with the non-AP MLD operating in EMLMR mode awakes for data transmission of service 2, the non-AP MLD may keep the other eMLMR STAs in doze to save power.

**Proposed Solution:**

After a STA affiliated with a non-AP MLD operating in EML mode awakes from doze to retrieve BUs, the STA will transmit a PS-Poll or QoS Null frame to the associated AP. So it is a good choice to piggback the intention to operate with all EML STAs awake or not on PS-Poll or QoS Null frame. Specifically, if the non-AP MLD intends to operate with all EML STAs awake, the STA indicates the intension by setting B14 of the Frame Control field of the PS-Poll or QoS Null frame to 1. Transition Delay after receiption of ACK corresponding to the PS-Poll or QoS Null, the non-AP MLD operates in EMLSR mode.

After a STA affiliated with a non-AP MLD operating in EML mode awakes from doze for UL transmission or unannounced TWT SP initally, other EML STAs will keep their power states by default. If the non-AP MLD intends to operate with all EML STAs awake during this awake period, the STA may send a QoS Null frame with EML Mode subfield of Frame Control field setting to 1.

**End of discussion**

**Propose:**

*TGbe editor: Change 9.2.4.1.1 General as follows (track changes on):*

* **General**

The first three subfields of the Frame Control field of a PV0 frame are Protocol Version, Type, and Subtype. The remaining subfields of the Frame Control field depend on the setting of the Type and Subtype subfields.

For a frame carried in a non-S1G PPDU, when the Type subfield is not 1 or the Subtype subfield is not 6, the remaining subfields within the Frame Control field are To DS, From DS, More Fragments, Retry, Power Management, More Data, Protected Frame / EML Mode (10125), and +HTC. In this case, the format of the Frame Control field is shown in Figure 9-3 (Frame Control field format in non-S1G PPDUs when Type subfield is not equal to 1 or Subtype subfield is not equal to 6).

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|  | B0     B1 | B2   B3 | B4      B7 | B8 | B9 | B10 | B11 | B12 | B13 | B14 | B15 |
|  | Protocol  Version | Type | Subtype | To DS | From DS | More  Fragments | Retry | Power  Management | More Data | Protected Frame / EML Mode | +HTC |
| Bits: | 2 | 2 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| * **Frame Control field format in non-S1G PPDUs when Type subfield is not equal to 1 or Subtype subfield is not equal to 6 (10125)** | | | | | | | | | | | |

*TGbe editor: Change 9.2.4.1.9 Protected Frame subfield as follows (track changes on):*

* **Protected Frame / EML Mode subfield (10125)**

The Protected Frame subfield is set to 1 if the Frame Body field contains information that has been pro-cessed by a cryptographic encapsulation algorithm. The Protected Frame subfield is reserved in Control frames of subtype Control Frame Extension, except that the EML Mode subfield is set to 1 in PS-Poll frame if sent by a STA affiliated with a non-AP MLD operating in EMLSR or EMLMR mode and intending to operate with all STAs on the EML links awake. The subfield is set to 0 otherwise (10125). When the Protected Frame subfield is equal to 1, the Frame Body field is protected utilizing the cryptographic encapsulation algorithm and expanded as defined in Clause 12 (Security). The Protected Frame subfield is set to 0 in Data frames of subtype Null, QoS CF-Poll, and QoS CF-Ack +CF-Poll (see, for example, 12.3.4.2 (TKIP MPDU formats) and 12.5.2.1 (General) that show that the frame body needs to be 1 octet or longer to apply the encapsulation). The EML Mode subfield is set to 1 in Data frames of subtype QoS Null if sent by a STA affiliated with a non-AP MLD operating in EMLSR or EMLMR mode and intending to operate with all STAs on the EML links awake. The subfield is set to 0 otherwise (10125).

*TGbe editor: Remove the 6th paragraph of 35.3.17 as follows (track changes on):*

**35.3.17 Enhanced multi-link single radio operation**

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(10125)

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*TGbe editor: Insert the following paragraph between 9th and 10th paragraph of 35.3.17 as follows (track changes on):*

**35.3.17 Enhanced multi-link single radio operation**

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(10125) If a non-AP MLD operating in EMLSR mode intends to operate with all STAs on the EMLSR links awake after a STA affiliated with the non-AP MLD awakes from doze to retrieve BUs during this awake period, the STA may indicate the intension by setting EML Mode subfield of the Frame Control field of the PS-Poll or QoS Null frame sending to the corresponding AP to 1. Transition Delay after receiption of ACK corresponding to the PS-Poll or QoS Null, the non-AP MLD operates in EMLSR mode with all STAs on the EMLSR links awake. Otherwise, the EML Mode subfield of the Frame Control field of the PS-Poll or QoS Null frame is set to 0. When a STA affiliated with the non-AP MLD awakes for UL transmission or unannounced TWT SP initially, other STAs on the EMLSR links keeps their current power states by default. If the non-AP MLD intends to operate with all STAs awake during this awake period, the STA may send a QoS Null frame with EML Mode subfield of Frame Control field setting to 1.

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*TGbe editor: Change the following paragraph of 35.3.17 as follows (track changes on):*

**35.3.17 Enhanced multi-link single radio operation**

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NOTE 6—A STA affiliated with the non-AP MLD follows the rules defined in 11.2.3.7 (Receive operation for STAs in

PS mode) and 11.2.3.8 (Receive operation using APSD) except the additional rules defined in this subclause (10125).

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*TGbe editor: Insert the following paragraph between 12th and 13th paragraph of 35.3.18 as follows (track changes on):*

**35.3.18 Enhanced multi-link multi-radio operation**

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(10125) If a non-AP MLD operating in EMLMR mode intends to operate with all STAs on the EMLMR links awake after a STA affiliated with the non-AP MLD awakes from doze to retrieve BUs during this awake period, the STA may indicate the intension by setting EML Mode subfield of the Frame Control field of the PS-Poll or QoS Null frame sending to the corresponding AP to 1. After receiption of ACK corresponding to the PS-Poll or QoS Null, the non-AP MLD operates in EMLMR mode with all STAs on the EMLMR links awake. Otherwise, the EML Mode subfield of the Frame Control field of the PS-Poll or QoS Null frame is set to 0. When a STA affiliated with the non-AP MLD awakes for UL transmission or unannounced TWT SP initially, other STAs on the EMLMR links keeps their current power states by default. If the non-AP MLD intends to operate with all STAs awake during this awake period, the STA may send a QoS Null frame with EML Mode subfield of Frame Control field setting to 1.

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