**IEEE P802.11
Wireless LANs**

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| **LB 275 CR for R-TWT-Part 1** |
| **Date:** 2023-09-08 |
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**Abstract**

This submission proposes resolutions for the following CIDs () for TGbe LB275:

Group 1 (SP Termination): 19821, 19546

Group 2 (misc): 19099, 19303, 19801, 19666, 19826, 19988, 19999

Revisions:

* Rev 0: Initial version of the document
* Rev 1: Revised resolution to 19303 based on offline discussion

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 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe 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.***

***TGbe editor: The baseline for this document is P802.11be D4.0 and P802.11meD4.0***

**Group 1: CIDs related to SP Early Termination**

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 19821 | Muhammad Kumail Haider | 35.8 | 0.00 | Baseline rules for TWT SP termination do not provide STA with a method to indicate its state of termination; whether it is requesting termination or it is ready for it. Currently it's only a notification from AP side. | TWT SP termination signaling should be revised for an explicit indication from the STA about its state/readiness for SP termination | **Revised**Agree in principle. Additional signaling for TWT SP termination is defined in this document to address the issues raised by commenter.**TGbe editor, please make change as shown in 23/1535r1 tagged by #19821** |
| 19546 | Carlos Aldana | 35.3.24 | 578.00 | There is no explicit signaling from STA side to inform AP that there isno uplink traffic expected within current SP so that AP may terminate SPearly. An explicit indication is needed. | Make modifications similar to those described in 11-23-754-03 | **Revised**Agree in principle. Additional signaling for TWT SP termination is defined in this document to address the issues raised by commenter.**TGbe editor, please make change as shown in 23/1535r1 tagged by #19821** |

**Discussion**

TWT SP early termination rules are defined in 26.8.5, and R-TWT STAs may follow the baseline procedures to early terminate an on-going SP.

As discussed in detail in 22/0304, a key issue with baseline rules is that an AP may early terminate the SP without checking with the STA if it is ready to terminate the SP. That is, the early termination procedure is not a handshake but rather a single notification from the AP (e.g., using EOSP=1). Conversely, there is no explicit signaling for a STA to request an early termination of the SP e.g., if it is done transmitting its traffic for the SP, or if the STA needs to go into doze state for power saving.

One possibility in existing spec is to use buffer status report by the STA to indicate to the AP its end of pending traffic. However, there are a few gaps in this implicit approach (please refer to 22/0304 for detailed discussion):

* BSR reports the instantaneous buffer of the queues at the STA. It is possible that instantaneous buffer at the STA at the time of reporting is zero, but STA still intends to use the rest of the service period (e.g., traffic intended to be delivered during the SP hasn’t arrived yet, is in graphics pipeline etc.). In such cases, BSR may give the wrong indication about STA’s use of the SP as it is not a direct signal for SP usage.
* The AP is not required/recommended to wait for or inquire the buffer status of the STA before terminating the SP
* For R-TWT, traffic intended for delivery during SPs is tied to R-TWT TIDs. This requires delivering BSR for possibly multiple TIDs instead of a simple, explicit indication.

As highlighted by above discussion and comments raised in LB275 stated above, there is a need for an explicit indication from the STA side that it is ready to terminate the on-going SP after end of traffic at its end. And the AP is recommended to wait to receive this indication from the STA before terminating the SP.

Therefore, as a resolution to above CIDs, we propose to redefine bit 7 of the QoS Control subfield of QoS Null frames sent by non-AP STAs as the EOTSP (End of Traffic for SP) indication.

**9.2.4.5 QoS Control field**

**9.2.4.5.1 QoS Control field structure**

***TGbe editor: Please modify row 6 of Table 9-10 (QoS Control field) as follows:***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Applicable frame (sub)types** | **Bits 0-3** | **Bit 4** | **Bits 5-6** | **Bit 7** | **Bits 8** | **Bit 9** | **Bit 10** | **Bit 11-15** |
| … | … | … | … | … | … |
| QoS Data and QoS Data+CF-Ack frames sent in a nonmesh BSS by non-AP STAs that are not a TPU buffer STA or a TPU sleep STA | TID | 0 | Ack Policy Indicator | AMSDU Present | TXOP Duration Requested |
| TID | 1 | Ack Policy Indicator | AMSDU Present | Queue Size |
| QoS Null frames sent in a nonmesh BSS by non-AP STAs that are not a TPU buffer STA or a TPU sleep STA | TID | 0 | Ack Policy Indicator | Reserved | TXOP Duration Requested |
| TID | 1 | Ack Policy Indicator | (#19821)~~Reserved~~EOTSP | Queue Size |
| … | … | … | … | … | … | … | … | … |

***TGbe editor: Please add a new subclause in 9.2.4.5 as follows:***

(#19821)**9.2.4.5.xxx EOTSP subfield**

﻿The End of Traffic for SP (EOTSP) subfield indicates if there is no further pending traffic from the transmitting non-AP STA during the current TWT service period. The EOTSP subfield is set to 1 if the transmitting non-AP STA does not have any more pending traffic to be delivered during the current TWT service period, and it is set to 0 if the transmitting non-AP STA either has more pending traffic to be delivered or does not know whether there is more pending traffic during the current TWT service period.

***TGbe editor: Please insert the following paragraphs at the end of 35.3.24.1 in P802.11beD3.1:***

**35.3.24 TWT operation**

**35.3.24.1 General**

﻿(#19821)A TWT requesting STA or a TWT scheduled STA may set the EOTSP subfield to 1 in a QoS Null frame it transmits to a TWT responding STA or a TWT scheduling AP during an on-going TWT SP to indicate that the STA does not have any pending traffic for the remainder of the current TWT SP.

(#19821)A TWT responding STA or a TWT scheduling AP, which receives a QoS Null frame with the EOTSP subfield equal to 1 from a TWT requesting STA or a TWT scheduled STA during a TWT SP, may terminate the TWT SP for that STA as described in 26.8.5 (Power save operation during TWT SPs).

**Group 2: Misc. CIDs**

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| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 19099 | Kazuto Yano | 9.4.2.198 | 234.49 | A period is missing at the end of this sentence. | Add a period at the end of this sentence. | **Accepted** |
| 19303 | John Wullert | 35.8.3.1 | 612.60 | Text in this paragraph uses a double-negative ("AP that does not correspond to a non-transmitted BSSID") as a condition. The next paragaph descibes the same condition without the double negative. Describing the same condition two different ways in such close proximity is confusing. | Replace "When an AP that does not correspond to a nontransmitted BSSID..." with "When an AP corresponding to a transmitted BSSID..." | **Rejected**An AP that does not correspond to a non-transmitted BSSID encompasses the following AP configurations: AP corresponding to transmitted BSSID, AP belonging to a co-hosted BSSID set or a single BSSID, and is not the same as AP corresponding to a transmitted BSSID case, and hence the double-negative is the correct usage. |
| 19801 | Abhishek Patil | 35.8.3.1 | 613.27 | Clarify that the rTWT schedule is indicated via the TWT IE carried within the nonTxBSSID profile. | Add "TWT element carried within a" between 'a' and 'nontransmitted BSSID' | **Accepted**  |
| 19666 | Dana Ciochina | 35.8.5 | 616.03 | An R-TWT scheduling AP or a member R-TWT scheduled STA that has initiated or participated in a frame exchange during an R-TWT SP shall ensure ..". I think "participated" should either be in present or present perfect, but not past tense. | as in comment | **Revised**Agree in principle. The sentence is amended as suggested.**TGbe editor, please make change as shown in 23/1535r1 tagged by #19666** |
| 19826 | Muhammad Kumail Haider | 35.8.3.1 | 614.25 | "Agreement" is the term for individual TWT. | Change 'agreement' to 'schedule'. | **Accepted** |
| 19988 | Rubayet Shafin | 35.8.1 | 611.35 | A restricted TWT schedule is set up in a per-TID based. For trigger-enabled restricted TWT (r-TWT), AP should have the mechanism to trigger a member r-TWT scheduled STA based on the TID corresponding to its latency-sensitive traffic(which TID the AP wants to trigger at a particular time during r-TWT SP can based on AP's scheduling decision). However, this mechanism to only trigger uplink PPDU corresponding to Latency-sensitive traffic, which would be critical for trigger-enabled r-TWT operation, is currently missing in the specification. | Please provide mechanisms, frameworks, and rules for enabling per-TID based triggering for R-TWT operation. | **Rejected**A mechanism to enable per TID based Triggering operation was discussed in 22/1828r1 and SP failed to get majority support (18Y/38N/11A). There is no consensus in the group to pursue this direction. |
| 19999 | Rubayet Shafin | 35.8.1 | 611.35 | R-TWT SP extension mechanism would be needed for efficient delivery of low latency traffic but is currently missing. | Please provide a mechanism for R-TWT SP extension | **Rejected**Signaling for TWT SP extension was discussed in 22/1959r1 and SP failed to get majority support (8Y/47N/6A). There is no consensus in the group to pursue this direction. |

**35.8.5 Traffic delivery**

***TGbe editor: Please modify 1st paragraph in 35.8.5 in P802.11beD4.0 as follows:***

An R-TWT scheduling AP or a member R-TWT scheduled STA that (#19666)~~has~~ initiates~~d~~ or participates~~d~~ in a frame exchange during an R-TWT SP shall ensure that QoS Data frames of the R-TWT TID(s) are delivered first during the R-TWT SP.