IEEE P802.11
Wireless LANs

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| CC36 CR on EDCA Operation for Restricted TWT  |
| Date: 2021-12-20 |
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Abstract

This submission proposes resolutions for the following CIDs for TGbe CC36:

5877, 5879, 6547, 6356, 7865

Revisions:

* Rev 0: Initial version of the document

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 11be D1.31.***

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 5877 | Liangxiao Xin | 35.6.4 | 298.37 | Which EDCAF should be used for the channel contention of R-TWT SP? If we use the existing EDCAF, it mixes the purposes of channel contention for non-latency sensitive traffic and latency sensitive traffic | add a new EDCAF for the channel contention of R-TWT SP only. | RevisedAgreed it is necessary to specify a mechanism to differentiate the EDCA Parameter Sets during or outside of Restricted TWT SPs adopted by r-TWT scheduled STAs and r-TWT unscheduled STAs.**Instruction to the editor**, ***please update the text in the subclause 35.7.3 Restricted TWT service periods announcement, insert the new subclause 35.7.4.3 EDCA operation during or outside of restricted TWT service periods, and insert the new subclause at the end of subclause 9.4.2 Elements, as shown in this document (doc.: IEEE 802.11-21/1859 r0).*** |
| 5879 | Liangxiao Xin | 35.6.4 | 298.37 | ast channel access and the fairness issue should be considered for a R-TWT member STA. While STA should have higher priority to access the channel during R-TWT SP, it should lower its priority to access the channel outside R-TWT SP. | change the EDCA and MU-EDCA of ACs at R-TWT member STAs to accesserate their channel access during a R-TWT SP and slow down their channel access for a period of time after a R-TWT SP. | RevisedAgreed it is necessary to specify a mechanism to differentiate the EDCA Parameter Sets during or outside of Restricted TWT SPs adopted by r-TWT scheduled STAs and r-TWT unscheduled STAs.**Instruction to the editor**, ***please update the text in the subclause 35.7.3 Restricted TWT service periods announcement, insert the new subclause 35.7.4.3 EDCA operation during or outside of restricted TWT service periods, and insert the new subclause at the end of subclause 9.4.2 Elements, as shown in this document (doc.: IEEE 802.11-21/1859r0).*** |
| 6547 | Patrice Nezou | 35.6.4 | 298.40 | A medium access mechanism has to be specified during the TWT service period. | Use dedicated EDCA parameters during the TWT service period to optimize bandwidth usage. | RevisedAgreed it is necessary to specify a mechanism to differentiate the EDCA Parameter Sets during or outside of Restricted TWT SPs adopted by r-TWT scheduled STAs and r-TWT unscheduled STAs.**Instruction to the editor**, ***please update the text in the subclause 35.7.3 Restricted TWT service periods announcement, insert the new subclause 35.7.4.3 EDCA operation during or outside of restricted TWT service periods, and insert the new subclause at the end of subclause 9.4.2 Elements, as shown in this document (doc.: IEEE 802.11-21/1859r0).*** |
| 6356 | Mohamed Abouelseoud | 35.6.4 | 298.37 | Currently the scheduled RTWT is not guarnteed to start at the scheduled time. Non-AP EHT STAs and future 802.11 deviced can ignore the quite element and gain access to the channle. | define a procedure to increase the chance of the AP or the members of the RTWT gaining access to the channel to start the RTWT | RevisedAgreed it is necessary to specify a mechanism to differentiate the EDCA Parameter Sets during or outside of Restricted TWT SPs adopted by r-TWT scheduled STAs and r-TWT unscheduled STAs.**Instruction to the editor**, ***please update the text in the subclause 35.7.3 Restricted TWT service periods announcement, insert the new subclause 35.7.4.3 EDCA operation during or outside of restricted TWT service periods, and insert the new subclause at the end of subclause 9.4.2 Elements, as shown in this document (doc.: IEEE 802.11-21/1859r0).*** |
| 7865 | Yonggang Fang | 35.6.4 |  | The clause 35.6.4 is about channel access rules for restricted TWT. However, no channel access rule has been defined to support time sensitive traffic to access to media in the restricted TWT SP. | Please specify channel access mechanisms and rules to be used for time sensitive traffic in restricted TWT SP. | RevisedAgreed it is necessary to specify a mechanism to differentiate the EDCA Parameter Sets during or outside of Restricted TWT SPs adopted by r-TWT scheduled STAs and r-TWT unscheduled STAs.**Instruction to the editor**, ***please update the text in the subclause 35.7.3 Restricted TWT service periods announcement, insert the new subclause 35.7.4.3 EDCA operation during or outside of restricted TWT service periods, and insert the new subclause at the end of subclause 9.4.2 Elements, as shown in this document (doc.: IEEE 802.11-21/1859r0).*** |

**Discussion:**

The protection mechanism of r-TWT SPs specified in 11be Draft 1.31 seems to be not enough, which would impact the scheduled transmition of lantency-sensitve traffic during the r-TWT SPs. For example, the Non-AP EHT STAs may behave as if overlapping quiet intervals do not exist, which means that the unscheduled EHT STAs may contend for channel access during the SPs. And the support for the quiet fuction with the Quiet element is also optional for the legacy STAs, which means that the legacy STAs would also contend for the channel access during the SPs when not supporting the quiet function. Furthermore, the currently specified protection mechanism of r-TWT SPs looks unfair for the legacy STAs supporting Quiet function. Therefore it is considered as a candidate solution to add an optional function for the configuration of EDCA Parameters Sets during the SPs or outside of SPs for different roles of EHT STAs including r-TWT scheduled STAs and r-TWT unscheduled STAs, which can further protect the r-TWT SPs and handle the unfairness issue. Based on the function the related parmeters/fields are added to the Restricted TWT SPs element. The NSEP priority access in 11be Draft 1.31 also specified the action frames to adjust the EDCA Parameters Set of authorized non-AP STAs for priority access, which can be regarded as a reference for the candidate solution.

This document proposes a candidate mechanism to differentiate the EDCA Parameter Sets during or outside of Restricted TWT SPs adopted by r-TWT scheduled STAs and r-TWT unscheduled STAs.

* EDCA parameters of r-TWT scheduled STAs and unscheduled STAs during r-TWT SPs would lead to:
* higher priority of the ACs corresponding to r-TWT UL TID(s) of r-TWT scheduled STAs
* disallowed or reduced channel access for the associated MPDUs of other ACs of r-TWT scheduled STAs
* disallowed channel access for r-TWT unscheduled STAs
* EDCA parameters of r-TWT scheduled STAs and unscheduled STAs outside of r-TWT SPs would lead to:
* disallowed or reduced channel access for the associated MPDUs of the ACs corresponding to r-TWT UL TID(s) of r-TWT scheduled STAs
* lower priority or the same level of priority as r-TWT unscheduled STAs’ for channel access of the associated MPDUs of other ACs of r-TWT scheduled STAs
* higher priority of channel access for r-TWT unscheduled STAs

**Proposed Text Change:**

# 9. Frame formats

## 9.3.3 Management frames

***TGbe editor: insert a new row to Table 9-32 (Beacon frame body)***

**Table 9-32—Beacon frame body (#5877)**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <Last assigned + 1> | Restricted TWT EDCA Parameter Set | (#5877)The Restricted TWT EDCA Parameter Set element is optionally present if dot11RestrictedTWTOptionImplemented is true. |

***TGbe editor: insert a new row to Table 9-39 (Probe Response frame body)***

**Table 9-39—Probe Response frame body (#5877)**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <Last assigned + 1> | Restricted TWT EDCA Parameter Set | (#5877)The Restricted TWT EDCA Parameter Set element is optionally present if dot11RestrictedTWTOptionImplemented is true. |

## 9.4.2 Elements

TGbe editor: insert the following subclause as follows. Note: the subclause number xxx can be changed to applicable number in subclause (9.4.2 Element) and the figure numbers can be changed accordingly as well.

### 9.4.2.xxx Restricted TWT EDCA Parameter Set element (5877, 5879, 6547, 6356, 7865)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|    | Element ID | Length | Element ID extension | EDCA Parameter Set Presence Bitmap | EDCA Parameter Set for r-TWT Scheduled STAs In SPs  | EDCA Parameter Set for r-TWT Scheduled STAs Outside SPs (optional) | EDCA Parameter Set for r-TWT Unscheduled STAs In SPs (optional) | EDCA Parameter Set for r-TWT Unscheduled STAs Outside SPs (optional) |
| Octets: | 1 | 1 | 1 | 1 | 20 | 0 or 20 | 0 or 20 | 0 or 20 |
| Figure 9-xxx –Restricted TWT EDCA Parameter Set element format |  |

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1 (General).

The format of the EDCA Parameter Set Presence Bitmap field is shown in Figure 9-xxx-b (EDCA Parameter Set Presence Bitmap field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2  | B3 B7 |
|  | EDCA Parameter Set for r-TWT Scheduled STAs Outside SPs Present | EDCA Parameter Set for r-TWT Unscheduled STAs In SPs Present | EDCA Parameter Set for r-TWT Unscheduled STAs Outside SPs Present | Reserved |
| Bits: | 1 | 1 | 1 | 5 |

**Figure 9-xxx- – EDCA Parameter Set Presence Bitmap field format**

The EDCA Parameter Set for r-TWT Scheduled STAs Outside SPs Present subfield indicates if the EDCA Parameter Set for r-TWT Scheduled STAs Outside SPs field is present. When this subfield is set to 1, the EDCA Parameter Set for r-TWT Scheduled STAs Outside SPs field is present; and set to 0 otherwise.

The EDCA Parameter Set for r-TWT Unscheduled STAs In SPs Present subfield indicates if the EDCA Parameter Set for r-TWT Unscheduled STAs In SPs field is present. When this subfield is set to 1, the EDCA Parameter Set for r-TWT Unscheduled STAs In SPs field is present; and set to 0 otherwise.

The EDCA Parameter Set for r-TWT Unscheduled STAs Outside SPs Present subfield indicates if the EDCA Parameter Set for r-TWT Unscheduled STAs Outside SPs field is present. When this subfield is set to 1, the EDCA Parameter Set for r-TWT Unscheduled STAs Outside SPs field is present; and set to 0 otherwise.

The EDCA Parameter Set for r-TWT Scheduled STAs In SPs field specifies the EDCA Parameter Set for r-TWT scheduled STA(s) during SPs by the EDCA Parameter Set element which is defined in 9.4.2.28 (EDCA Parameter Set element).

The EDCA Parameter Set for r-TWT Scheduled STAs Outside SPs field specifies the EDCA Parameter Set for r-TWT scheduled STA(s) outside of SPs by the EDCA Parameter Set element which is defined in 9.4.2.28 (EDCA Parameter Set element).

The EDCA Parameter Set for r-TWT Unscheduled STAs In SPs field specifies the EDCA Parameter Set for r-TWT unscheduled STAs during SPs by the EDCA Parameter Set element which is defined in 9.4.2.28 (EDCA Parameter Set element).

The EDCA Parameter Set for r-TWT Unscheduled STAs Outside SPs field specifies the EDCA Parameter Set for r-TWT unscheduled STAs outside of SPs by the EDCA Parameter Set element which is defined in 9.4.2.28 (EDCA Parameter Set element).

# 35. Extremely High Throughput (EHT) MAC specification

# 35.7 Restricted TWT

***TGbe editor: replace the following part shown in grey-highlighted text in Subclause 35.7.3 (Restricted TWT Service Periods announcement) with the text marked as NEW TEXT:***

## ~~35.7.3 Restricted TWT service periods announcement~~

~~If there is any restricted TWT agreement set up, the EHT AP shall announce the restricted TWT service period schedule information in the modified broadcast TWT element contained in transmitted Management frames, which are specified in 26.8.3 (Broadcast TWT operation).~~

 ***TGbe editor: NEW TEXT as follows:***

# 35.7.3 Restricted TWT service periods announcement (5877, 5879, 6547, 6356, 7865)

If there is any restricted TWT agreement set up, the EHT AP shall announce the restricted TWT service period schedule information in the broadcast TWT element that carries one or more Restricted TWT Parameter Set fields, as defined in 9.4.2.199 (TWT element) and the optional Restricted TWT EDCA Parameter Set element contained in transmitted Management frames.

# 35.7.4 Channel access rules for restricted TWT service periods

***TGbe editor: insert the following subclause as follows:***

# 35.7.4.3 EDCA operation during or outside of restricted TWT service periods (5877, 5879, 6547, 7462)

A non-AP EHT STA with dot11RestrictedTWTOptionImplemented set to true shall manage its EDCA parameter sets as follows:

—During the restricted TWT service periods, the r-TWT scheduled STAs shall update its CWmin[AC], CWmax[AC], AIFSN[AC], and TXOP[AC] state variables to the values provided in the EDCA Parameter Set for r-TWT Scheduled STAs In SPs field of the Restricted TWT EDCA Parameter Set element corresponding to the restricted TWT service periods, announced by the EHT AP, if the Restricted TWT EDCA Parameter Set element is present.

—During the restricted TWT service periods, the r-TWT unscheduled STAs shall update its CWmin[AC], CWmax[AC], AIFSN[AC], and TXOP[AC] state variables to the values provided in the EDCA Parameter Set for r-TWT Unscheduled STAs In SPs field of the Restricted TWT EDCA Parameter Set element corresponding to the restricted TWT service periods, announced by the EHT AP, if the Restricted TWT EDCA Parameter Set element and its EDCA Parameter Set for r-TWT Unscheduled STAs In SPs field are present.

—Outside of the restricted TWT service periods, the r-TWT scheduled STAs shall update its CWmin[AC], CWmax[AC], AIFSN[AC], and TXOP[AC] state variables to the values provided in the EDCA Parameter Set for r-TWT Scheduled STAs Outside SPs field of the Restricted TWT EDCA Parameter Set element corresponding to the restricted TWT service periods, announced by the EHT AP, if the Restricted TWT EDCA Parameter Set element and its EDCA Parameter Set for r-TWT Scheduled STAs Outside SPs field are present.

—Outside of the restricted TWT service periods, the r-TWT unscheduled STAs shall update its CWmin[AC], CWmax[AC], AIFSN[AC], and TXOP[AC] state variables to the values provided in the EDCA Parameter Set for r-TWT Unscheduled STAs Outside SPs field of the Restricted TWT EDCA Parameter Set element corresponding to the restricted TWT service periods, announced by the EHT AP, if the Restricted TWT EDCA Parameter Set element and its EDCA Parameter Set for r-TWT Unscheduled STAs Outside SPs field are present.

**References:**

[1] CC36-CR-35.6 Restricted TWT Announcement, IEEE 802.11-21/1147r4