IEEE P802.11
Wireless LANs

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| LB271: CR for P2P and rTWT |
| Date: 2023.03.07 |
| Author(s): |
| Name | Company | Address | Phone | email |
| Pascal Viger | CANON |  |  |  |
| Stéphane Baron |  |  |  |
| Romain Guignard |  |  |  |
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Abstract

This submission proposes resolutions for the following 5 CIDs for TGbe LB271 (D3.0).

16295, 16296, 16297, 16298, 16299.

Revisions:

- Rev 0: Initial version of the document.

- Rev 1 : update after received comments

***TGbe editor: The baseline for this document is P802.11be D3.0 and P802.11me D2.1***

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 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.***

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| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 16295 | 35.3.24.3 | 586/26 | The transmission of direct link frames shouldbe enabled by using MU-RTS TXS Trigger frames in an r-TWT period. In that case, the EHT STA is an r-TWT scheduled STA having specified a QoS Characteristics element accordingly. Issue is that P2P recipient is not aware of such negociations, and may be in doze state for TWT SP it is not member of (initiating P2P STA is member of). There is high risk of lost TWT/TXS resource (not used) | Make the recipient P2P STA aware of the TWT membership. It thus can be awake for the service periods to come in this rTWT schedule, hence be available for P2P communication with the initiator peer STA. | **Revised**Agree in principle with the comment. Proposed resolution is to describe the mechanisms facilitate the P2P communications.**TGbe editor, please make changes as shown in doc 11-23/0353r1 tagged by #16299** |
| 16296 | 35.8.3 | 619/12 | The broadcast TWT setup is performed between a requesting STA and the AP. In case of P2P communication during a SP between the requesting STA and its peer STA, it is not clear how this peer STA is enrolled in the bTWT agreement. Indeed, if the peer STA is not informed about the TWT agreement, the peer STA could be in doze state and not be able to receive the data from the requesting STA. | The standard shall propose a mean to inform a P2P communication receiver STA that it will be involved as a receiver during a bTWT SP. | **Revised**Agree in principle with the comment. Proposed resolution is to describe the mechanisms facilitate the P2P communications.**TGbe editor, please make changes as shown in doc 11-23/0353r1 tagged by #16299** |
| 16299 | 9.6.12.6 | 308/1 | The broadcast TWT setup is performed between a requesting STA and the AP. In case of P2P communication during a SP between the requesting STA and its peer STA, it is not clear how this peer STA is enrolled in the bTWT agreement. Indeed, if the peer STA is not informed about the TWT agreement, the peer STA could be in doze state and not be able to receive the data from the requesting STA. | The standard shall propose a mean to inform a P2P communication receiver STA that it will be involved as a receiver during a bTWT SP : Broadcast TWT ID can be provided to that purpose.. | **Revised**Agree in principle with the comment. Proposed resolution is to describe the mechanisms facilitate the P2P communications.**TGbe editor, please make changes as shown in doc 11-23/0353r1 tagged by #16299** |
|  |  |  |  |  |  |
| 16297 | 9.4.2.316 | 295/3 | In order to better support P2P traffic, there is a need to update QoS Characteristics element format by specific information related to P2P (e.g. for TXS) such as the STA AID of P2P recipient STA. By knowing recipient P2P STA's AID, AP can invite it to join a same TWT session so STA is awake at SP | As per comment | **Revised**Agree in principle with the comment. Proposed resolution is to describe the mechanisms facilitate the P2P communications.**TGbe editor, please make changes as shown in doc 11-23/0353r1 tagged by #16297** |
| 16298 | 9.4.2.316 | 295/3 | For direct link traffic, the information of the receiving peer STA could be valuable to help the AP in its scheduling and for instance to avoid multiple communication to the same STA (P2P and DL) | Add an information to inform the AP of the peer receiver STA in case of direct link communication. | **Revised**Agree in principle with the comment. Proposed resolution is to describe the mechanisms facilitate the P2P communications.**TGbe editor, please make changes as shown in doc 11-23/0353r1 tagged by #16297** |

# Discussion:

The SCS, TDLS, rTWT and TXS mechanisms can work in combination.

The Triggered TXOP Sharing (TXS) mechanism allows an AP to allocate a portion of the time within an obtained TXOP to only one associated non-AP 802.11be station for the latter to transmit one or more non-TB PPDUs. The TXS mechanism facilitates P2P communications within a TXOP obtained by the AP.

As the SCS and rTWT mechanisms are negotiated between an initiator non-AP station and the AP, hence excluding the other peer non-AP station partner to the P2P communication with the initiator peer non-AP station, there are few chances that the partner peer non-AP station be awake and therefore available for TXS-based P2P communication within an rTWT SP of the negotiated rTWT schedule.

This contribution provides two complementary mechanisms to facilitate the P2P communications:

* Option #1 :

**notify the partner peer non-AP station of the BSS about the rTWT schedule** negotiated between the initiator peer non-AP station and the AP of the BSS, in order for the partner peer to be awake for the next rTWT SP of the rTWT schedule, hence to be available for P2P communication

* A TDLS initiator STA sends to its TDLS responder STA a TDLS Action frame including an rTWT information about the rTWT schedule

* Option #2 :

**an AP** of a BSS that has established membership of a peer station in the rTWT schedule and that detects P2P traffic between the peer station and a partner peer station of the BSS, **may notify the partner peer station about the existing rTWT schedule.**

the AID of partner peer station is carried in an additional subfield to the QoS Characteristics element

 🡪 TWT scheduling AP sends an unsolicited TWT Response frame to the partner peer STA

Comments received:

1. A commenter thinks it could be possible to setup an individual TWT in between 2 P2P STAs, timely copying the R-TWT setup between one P2P STA and the AP.
* This seems too complicated, and creates overhead in SP alignment when R-TWT schedule changes.
1. Option 1 is subject to STAs supporting Broadcast TWT -> agree, add missing text (note this was already indicated for option 2)

# Proposed text change (Option 1)

TGbe editor: Modify the subclauses as follows in 802.11be D3.0:

**9.6.12 TDLS Action field formats**

* + - 1. **TDLS Setup Request Action field format**

***Change the row “AID” and insert a new row “EHT Capabilities” in*** [***Table 9-494 (Information***](#bookmark259)[***for TDLS Setup Request Action field)***](#bookmark259) ***as follows (not all lines shown):***

**Table 9-494—Information for TDLS Setup Request Action field**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| 19 | AID | The AID element containing the AID of the STA or non-AP MLD whose affiliated STA is sending the frame is present if dot11VHTOptionImplemented, dot11HEOptionImplemented, dot11EHTOptionImplemented or dot11S1GOptionImple- mented is true. |
| <Last assigned + 1> | EHT Capabilities | The EHT Capabilities element is present if dot11EHTOption- Implemented is true; otherwise it is not present. |
| <Last assigned + 2> | Multi-Link | The TDLS Multi-Link element is present if the STA is affili- ated with a non-AP MLD; otherwise, it is not present. |
| <Last assigned + 3> | [16299] Broadcast TWT ID | [16299] The Broadcast TWT ID element indicates a specific Broadcast TWT accepted by the TWT scheduling AP and for which the transmitting STA (TDLS initiator STA acting as TWT scheduled STA) is providing TWT parameters to its partner TDLS responder STA.Note: TDLS responder STA has indicated being able to operate as a TWT scheduled STA, by having set the Broadcast TWT Support field to 1 in the HE Capabilities element it transmits. |

* + - 1. **TDLS Setup Response Action field format**

***Change the row “AID” and insert a new row “EHT Capabilities” in*** [***Table 9-495 (Information***](#bookmark260)[***for TDLS Setup Response Action field)***](#bookmark260) ***(not all lines shown):***

**Table 9-495—Information for** **TDLS Setup Response Action field**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| 20 | AID | The AID element containing the AID of the STA or non-AP MLD whose affiliated STA is sending the frame is present if dot11VHTOptionImplemented, dot11HEOptionImplemented, dot11EHTOptionImplemented or dot11S1GOptionImple- mented is true and the Status Code is SUCCESS and not pres- ent otherwise. |
| <Last assigned + 1> | EHT Capabilities | The EHT Capabilities element is present if dot11EHTOption- Implemented is true; otherwise it is not present. |
| <Last assigned + 2> | Multi-Link | The TDLS Multi-Link element is present if the STA is affili- ated with a non-AP MLD and the TDLS Setup Request frame soliciting a response carried TDLS Multi-Link element; other- wise, it is not present. |
| <Last assigned + 3> | [16299] Broadcast TWT ID | [16299] The Broadcast TWT ID element is present if a Broadcast TWT ID element is present in the TDLS Setup Request frame that elicited this TDLS Setup Response frame.The Broadcast TWT ID element indicates a specific Broadcast TWT accepted by the TWT scheduling AP and for which the receiving STA (TDLS initiator peer acting as TWT scheduled STA) has providing TWT parameters to its partner TDLS responder STA (able to operate as a TWT scheduled STA) sending this TDLS Setup Response frame. Otherwise, the Broadcast TWT ID element is not present. |

* + - 1. **TDLS Setup Confirm Action field format**

***Insert the following row in*** [***Table 9-496 (Information for TDLS Setup Confirm Action field)***](#bookmark261) ***(not all lines shown):***

**Table 9-496—Information for** **TDLS Setup Confirm Action field**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <Last assigned + 1> | EHT Operation | The EHT Operation element is present when dot11EHTOption- Implemented is true, the TDLS Setup Response frame con- tained an EHT Capabilities element, and the Status Code is SUCCESS; otherwise it is not present. The EHT Operation ele- ment is defined in 9.4.2.311 (EHT Operation element). |
| <Last assigned + 2> | Multi-Link | The TDLS Multi-Link element is present if the STA is affili- ated with a non-AP MLD and the preceding TDLS Setup Response frames carried TDLS Multi-Link element; otherwise, it is not present. |
| <Last assigned + 3> | [16299] Broadcast TWT ID | [16299] The Broadcast TWT ID element is present if the Status Code is SUCCESS; otherwise, it is not present. The Broadcast TWT ID indicates a specific Broadcast TWT accepted by the TWT scheduling AP and for which the transmitting STA (TDLS initiator STA acting as TWT scheduled STA) is providing TWT parameters to its partner TDLS responder STA (able to operate as TWT scheduled STA). |

TGbe editor: Modify the subclauses as follows from 802.11 REVme D2.1:

* TDLS Peer Traffic Indication Action field format

|  |
| --- |
| Table 9-501 - Information for TDLS Peer Traffic Indication Action field |
| Order | Information | Notes |
| 1 | Category | The Category field is defined in 9.4.1.11 (Action field).  |
| 2 | TDLS Action | The TDLS Action field is defined in 9.6.12.1 (TDLS Action field(#3729)). |
| 3 | Dialog Token | The dialog token is specified in 9.4.1.12 (Dialog Token field). |
| 4 | Link Identifier | The Link Identifier element is specified in 9.4.2.61 (Link Identifier element). |
| 5 | PTI Control | The PTI Control element is optionally present. It is defined in 9.4.2.64 (PTI Control element). |
| 6 | TPU Buffer Status | The TPU Buffer Status element is defined in 9.4.2.65 (TPU Buffer Status element). |
| <Last assigned + 1> | [16299] Broadcast TWT ID | [16299] The Broadcast TWT ID element is defined in 9.4.2.199 (TWT element) |

The TDLS Peer Traffic Indication Action field indicates the state of the power save buffer at the STA supporting TPU that is buffering data for a TDLS peer STA in power save mode.

The TPU Buffer Status element indicates the status of the AC buffers at the TPU buffer STA.

[16299] The Broadcast TWT ID element, if present, indicates a specific Broadcast TWT in which the transmitting STA is requesting the recipient STA to participate.

[16299] Note: By comprising the Broadcast TWT ID identifying the R-TWT schedule, hence its service periods, SPs, the TDLS Peer Traffic Indication Action frame allows the receiving TDLS peer STA, if able to operate as a TWT scheduled STA, to obtain the R-TWT timing parameters and the like about the SPs, from the Management frames sent by the TWT scheduling AP. The receiving TDLS peer STA can therefore awake at the appropriate time to receive (or exchange) data with TWT scheduled STA (TDLS peer STA) within the R-TWT SP.

* TDLS Peer PSM Request Action field format

The TDLS Peer PSM Request Action field contains the information shown in Table 9-505 (Information for TDLS Peer PSM Request Action field).

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| * Information for TDLS Peer PSM Request Action field
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| Order | Information | Notes |
| 1 | Category | The Category field is defined in 9.4.1.11 (Action field).  |
| 2 | TDLS Action | The TDLS Action field is defined in 9.6.12.1 (TDLS Action field(#3729)). |
| 3 | Dialog Token | The Dialog Token field contains a value that is unique among TDLS Peer PSM Request Action fields for which a corresponding TDLS Peer PSM Response Action field has not been received. The dialog token is specified in 9.4.1.12 (Dialog Token field). |
| 4 | Link Identifier | The Link Identifier element is specified in 9.4.2.61 (Link Identifier element). |
| 5 | Wakeup Schedule | The Wakeup Schedule element is specified in 9.4.2.62 (Wakeup Schedule element). |
| <Last assigned + 1> | [16299] Broadcast TWT ID | [16299] The Broadcast TWT ID element is defined in 9.4.2.199(TWT element).[16299] A TDLS peer STA may include a Broadcast TWT ID in the TDLS Peer PSM Request, and the wakeup schedule is established based on the Broadcast TWT ID for the TDLS direct link when the TDLS Peer PSM Response frame indicates status code SUCCESS. Preferably, the Broadcast TWT ID indicative of the wakeup schedule is present in the response if the status code is set to TDLS\_REJECTED\_ALTERNATIVE\_PROVIDED, and is not present otherwise.Note: both TDLS peer STAs are able to operate as TWT scheduled STAs (having set the Broadcast TWT Support field to 1 in the HE Capabilities element they transmit). |

The TDLS Peer PSM Request Action field is encapsulated in a Data frame and transmitted to the TDLS peer STA, directly or through the AP, to set up or change a periodic wakeup schedule on the TDLS direct link. See 11.2.3.12 (TDLS peer power save mode).

* TDLS Peer PSM Response Action field format

The TDLS Peer PSM Response Action field contains the information shown in Table 9-506 (Information for TDLS Peer PSM Response Action field).

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| * Information for TDLS Peer PSM Response Action field
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| Order | Information | Notes |
| 1 | Category | The Category field is defined in 9.4.1.11 (Action field).  |
| 2 | TDLS Action | The TDLS Action field is defined in 9.6.12.1 (TDLS Action field(#3729)). |
| 3 | Dialog Token | The dialog token is set to the value contained in the corresponding TDLS Peer PSM Request Action field. The dialog token is specified in 9.4.1.12 (Dialog Token field). |
| 4 | Status Code | The Status Code is specified in 9.4.1.9 (Status Code field). |
| 5 | Link Identifier | The Link Identifier element is specified in 9.4.2.61 (Link Identifier element). It is present if the Status Code is SUCCESS. |
| 6 | Wakeup Schedule | The Wakeup Schedule element is present is present if the status code is set to TDLS\_REJECTED\_ALTERNATIVE\_PROVIDED and is not present otherwise. The Wakeup Schedule element is specified in 9.4.2.62 (Wakeup Schedule element). |
| <Last assigned + 1> | [16299] Broadcast TWT ID | [16299] The Broadcast TWT ID element is defined in 9.4.2.199(TWT element).[16299] A TDLS peer STA may include a Broadcast TWT ID in the TDLS Peer PSM Request, and the wakeup schedule is established based on the Broadcast TWT ID for the TDLS direct link when the TDLS Peer PSM Response frame indicates status code SUCCESS.Note: both TDLS peer STAs are able to operate as TWT scheduled STAs (having set the Broadcast TWT Support field to 1 in the HE Capabilities element they transmit). |

The TDLS Peer PSM Response Action field is encapsulated in a Data frame and transmitted to the TDLS peer STA directly in response to a TDLS Peer PSM Request Action field. See 11.2.3.12 (TDLS peer power save mode).

# Proposed text change (Option 2)

TGbe editor: Modify the subclause as follows in 802.11be D3.0:

* + - 1. **QoS Characteristics element**

***TGbe editor: change Figure 9-1002au as follows***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Element ID | Length | Element IDExtension | Control Info | Minimum Service Interval | Maximum Service Interval | Minimum Data Rate |

Octets: 1 1 1 4 4 4 3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Delay Bound | Maximum MSDUSize | Service Start Time | Service Start Time LinkID | Mean Data Rate | Burst Size | MSDULifetime |

Octets: 3 0 or 2 0 or 4 0 or 1 0 or 3 0 or 4 0 or 2

|  |  |  |  |
| --- | --- | --- | --- |
| MSDUDelivery Ratio | MSDUCount Exponent | Medium Time | [16297] Peer STA ID |

Octets: 0 or 1 0 or 1 0 or 2 0 or 2

**Figure 9-1002au—QoS Characteristics element format**

***TGbe editor: please insert at the end of the section a new paragraph and Note as follows***

[16297] The Peer STA ID subfield is present if Direction subfield is set to 2 (Direct link). The Peer STA ID subfield may be present to inform the AP that the traffic defined by the present QoS characteristics element should be directed to the STA identified by the Peer STA ID subfield.

[16297] NOTE: When the AID of a partner peer STA is carried in the QoS Characteristics element, a TWT scheduling AP may enroll a partner peer STA in an rTWT schedule by notifying it about the rTWT schedule. The TWT scheduling AP sends an unsolicited TWT Response frame with the Trigger subfield set to 1 to the non-AP STA (partner peer STA) that has set the Broadcast TWT Support subfield to 1 in its HE Capabilities elements that it transmitted to the AP.

Do you agree to the resolution provided in doc 11-23/xxxr0 for CIDs 16295, 16296, 16297, 16298, 16299 ?