**IEEE P802.11
Wireless LANs**

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| **CIDs related to P2P TWT, Initial SA Ballot** |
| **Date: Nov 2023** |
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**Abstract**

This document addresses CIDs 6126, 6127, 6128, 6129, 6133, 6135 from 802.11me SA ballot.

The discussion and proposed changes are based on Draft P802.11REVme\_D4.0.

Revision history:

R0 – Initial version

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| **CID**Editorial | **Clause Number(C)** | **Comment** | **Proposed Change** | **Proposed change** |
| 6126 | 11.21.15 | "Timeout Interval Element" is sometimes referred as TIE abbreviation and sometime as whole. Would be good to have consistence, e.g. always refer to as TIE. | As in the comment | Rejected. The instances of “Timeout Interval Element” are in reference to the field and should stay as is.  |

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| **CID**Technical | **Clause Number(C)** | **Comment** | **Proposed Change** | **Proposed change** |
| 6128 | 11.21.15 | Please clarify that If STA has transmitted UL frames, then AP shall send ACK /BA even if the STA's negotiated P2P TWT SP starts during/before BA/ACK transmission. | As in the comment | RevisedInstruction to the 802.11me editors: Please incorporate text changes tagged (#6128) in this document. |
| 6129 | 11.21.15 | Please clarify that If AP is transmitting DL frame to STA when P2P TWT SP starts, then STA may send ACK /BA to the AP even if the STA's negotiated P2P TWT SP has started during/before BA/ACK transmission. | As in the comment | RevisedInstruction to the 802.11me editors: Please incorporate text changes tagged (#6129) in this document. |
| 6127 | 11.21.15 | What happens if a P2P TWT SP overlaps with a normal TWT SP; what would be the behavior of the AP and the STA? | Clarify the AP/STA behaviors in the described event as follows: An AP shall assume STA unavailability during a P2P TWT SP regardless of partially/fully overlapping I/BC/R (not a P2P) TWT SP. i.e. The P2P TWT SP (STA unavailability) has "higher priority" than I/BC/R TWT SPs. | RevisedInstruction to the 802.11me editors: Please incorporate text changes tagged (#6127) in this document. |
| 6130 | 9.4.2.248 | With regard to the subfield titled "TXOP Duration RTS Threshold" under HE Operation Parameters field, it is desirable to make the subfield applicable to non-associated STAs as well. It is likely that association request frames sent by a STA fail at the AP because of collision or hidden node activity, which may lead to potential block-listing of the AP by a STA. The AP may use leverage the "TXOP Duration RTS Threshold" subfield to require a STA to send RTS before initiation of authentication / association frame exchange. | As in the comment. Make the "TXOP Duration RTS Threshold" subfield applicable to non-associated STAs as well. | RevisedInstruction to the 802.11me editors: Please incorporate text changes tagged (#6130) in this document. |
| 6133 | 11.21.15 | Clarify what happens when the peer-to-peer TWT SP overlap with other TWT schedule between the AP and the same STA | As in the comment | RevisedInstruction to the 802.11me editors: Please incorporate text changes tagged (#6127) in this document. |
| 6135 | 11.21.15 | “Upon receipt of a Channel Usage element in the Probe Response or Channel Usage Response frame, the receiving STA may use the following: “The listed bullets are applied to the Channel Usage value is set to 0“ 1 and 2., not applied to other values. | Changed the cited sentence to “Upon receipt of a Channel Usage element with the Channel Usage field set to 0, 1 or 2 in the Probe Response or Channel Usage Response frame, the receiving STA may use the following:” | RevisedInstruction to the 802.11me editors: Please incorporate text changes tagged (#6135) in this document. |

**Discussion:**

**CID 6127, 6133**:

The Individual or Broadcast TWT SP assumes that STA is available for AP transmissions, while P2P TWT SP assumes that STA is in doze state. The 802.11 spec should have a clear rule how to operate in these situations to avoid interoperability issues.

The P2P TWT should have the higher priority in in possible overlap situations and the STA is not available during the time when P2P TWT SP is ongoing. The STA may define the times when it is not available in P2P TWT. The P2P TWT unavailability should not be rescheduled by the AP, because AP may not be aware of the processes that the STA is up to during the scheduled P2P TWT SP. Moreover, this would simply add to the complexity of the AP scheduler. The broadcast or individual TWT SP start times and SP durations may be rescheduled by the AP, so these periods should have lower priority, similarly as STA in active mode may not be available during the P2P TWT SPs.

**CID 6128, 6129**:

* Should an AP consider a STA to be in power save mode right at the start of a P2P TWT SP, regardless of the frame that was immediately transmitted, by the STA or the AP, before the start of the P2P TWT SP? E.g., what if the AP has just started a transmission of a frame to the STA where the transmission of the response frame may occur or overlap during the P2P TWT SP?

The AP should always send acknowledgement to the received frames regardless of the P2P TWT SP of the STA. This is according to the general principle of the frame acknowledgments, i.e., ACK/BA is always transmitted if solicited by a frame. Fast feedback of the received frames is also relevant to reduce transmission overheads and transmission latencies.

Sometimes AP DL transmission to the STA may overlap with the P2P TWT SP of the STA, or the STA may need to send a control response to AP transmission that may overlap with a P2P TWT SP. Currently, while the STA is allowed to send ACK/BA to the AP transmission, the AP would assume that the STA is available for the rest of the P2P TWT SP, which is an undesirable outcome given the planned P2P TWT SP.

It is beneficial to allow the non-AP STA to acknowledge the DL transmission and then start the P2P TWT SP and go to doze, because the AP gets response whether the transmitted frames are received. If the STA is not able to acknowledge the frames, the STA may return to doze without acknowledging the DL PPDU. This behaviour is similar as transmitting BA as a response to received frame regardless of the NAV in the channel.

Similarly, a late start of the P2P TWT SP would allow STA flexibility to response to Trigger frame, even if the solicited TB PPDU overlaps with P2P TWT SP. This would allow flexibility to STA to complete its data transmissions, if it is available for them.



Figure – Example of acknowledging a frame and then going to Doze state during the P2P TWT SP.

**Proposed Normative Text**

***Tgme editor, please make the following changes under the listed CIDs:***

11.21.15 Channel usage procedures

Channel usage information is a set of channels provided by an AP to non-AP STAs for operation of a

noninfrastructure BSS or an off-channel TDLS direct link. The (#3311)channel usage information

provided by the AP to the non-AP STA is to advise the STA on how to coexist with the infrastructure network.

Implementation of channel usage is optional for a WNM STA. A STA that implements channel

usage has dot11ChannelUsageImplemented equal to true. When dot11ChannelUsageImplemented is true,

dot11WirelessManagementImplemented shall be true, or the STA shall support acting as an S-AP

within a CCSS. A STA with dot11ChannelUsageActivated equal to true shall support channel usage and shall

set to 1 the Channel Usage field of the Extended Capabilities elements that it transmits.

A TWT agreement that is established between a STA and its associated AP, by exchanging

Channel Usage Request and Response frames, is referred to as a peer-to-peer TWT agreement and the

corresponding TWT schedules are referred to as peer-to-peer TWT schedules. In this case, the

Channel Usage element carried in the Channel Usage Request and Response frames may:

— include a single Channel Entry field with Operating Class and Channel field(s) that are different

from the associated AP’s BSS channel, or

— include a single Channel Entry field with Operating Class and Channel field(s) that are the same as

the associated AP’s BSS channel, or

— include no Channel Entry field.

Unless explicitly indicated in this subclause, the rules defined in 10.46 (Target wake time (TWT)) and

in 26.8 (TWT operation) shall be ignored when establishing and operating with a peer-to-peer TWT agreement. (#6127)

An AP that successfully sets up a peer-to-peer TWT agreement shall consider the non-AP STA follows the rules for peer-to-peer TWT agreement even if a peer-to-peer TWT SP overlaps with one or more SPs of Individual or Broadcast TWT agreements. Once the duration of a peer-to-peer TWT SP is over, the operation of the overlapping TWT SPs resumes for the remainder of the SP duration, if any.

NOTE 1—The TWT element is used for a peer-to-peer TWT agreement only to determine the timing parameters of the

Peer-to-peer TWT schedule.

An HE AP that has dot11ChannelUsageActivated equal to true and supports negotiating a peer-to-peer

TWT schedule that is requested by a non-AP STA to establish a noninfrastructure BSS or an offchannel

TDLS direct link shall set to 1 the Peer-to-peer TWT Support field of the Extended

Capabilities elements that it transmits.

NOTE 2—An HE AP has dot11TWTOptionImplemented equal to true and has the TWT Responder Support

subfield set to 1 in the Extended Capabilities element and the HE Capabilities element.

A non-AP STA that supports channel usage and is not associated to an AP prior to using a

noninfrastructure BSS or an off channel TDLS direct link may transmit a Probe Request frame

including both Supported Operating Classes and Channel Usage elements. A non-AP STA supporting

channel usage may send a Channel Usage Request frame at any time after association to the AP that

supports the use of channel usage to request the channel usage information for supported

operating classes. A non-AP STA that transmits a Channel Usage Request frame shall set the Usage

Mode field of the Channel Usage element to 2 if it requests assistance to setup a noninfrastructure BSS

on an off-channel that does not have any infrastructure BSSs operated by any AP that belongs to the ESS of its

associated AP. Otherwise, the non-AP STA shall set the Usage Mode field of the Channel Usage element to 0

or 1 or 3.

A non-AP STA that supports channel usage and has the TWT Requester Support subfield set to 1

in the HE Capabilities element that it transmits, may negotiate a peer-to-peer TWT schedule

with its associated AP, to indicate up the service period, and optionally the channel operation, of a

noninfrastructure BSS or an off-channel TDLS direct link, by transmitting a Channel Usage Request

frame that includes TWT Elements and Timeout Interval Element fields, if the AP has the

Peer-to-peer TWT Support field set to 1 in the Extended Capabilities element. Each TWT

element carried in the TWT Elements field includes a single Individual TWT Parameter Set field whose

subfields shall be set as described in 26.8.2 (Individual TWT agreements) and 9.4.2.198 (TWT

element) except that the TWT Group Assignment subfield shall be set to zero and the Responder PM Mode

subfield, the Trigger subfield, the Flow Type subfield, and the TWT Channel subfield shall be reserved. Each

TWT element in the TWT Elements field applies to all the Channel Entry subfields of the Channel Usage

Elements field. The non-AP STA may indicate the lifetime of the requested peer-to-peer TWT agreement in

the Timeout Interval Value field of the TIE that it includes in the Channel Usage Request frame and shall set

the Timeout Interval Type field to 5.

A non-AP STA may send a Channel Usage Request frame to its associated AP with a TWT element

configured as a TWT request. In this case, if the non-AP STA receives a Channel Usage Response frame from

the AP that includes a TWT element configured as a TWT response with the TWT Setup Command field

indicating Accept TWT, then the non-AP STA has successfully completed the peer-to-peer TWT agreement

with the AP for the TWT flow identifier indicated in the TWT element that is carried in the Channel Usage

Response frame. Otherwise, that peer-to-peer TWT agreement has not been established. The TWT flow

identifier, together with the MAC addresses of the requesting STA and the responding AP, identifies the peerto-

peer TWT agreement.

A non-AP STA that has already selected a Channel for peer-to-peer communication may transmit a

Channel Usage Request frame with the Usage Mode field of the Channel Usage element set to 3 and without a

Channel Entry field to inform the AP about its unavailability during the peer-to-peer TWT agreement.

Otherwise, the non-AP STA may set the Usage Mode field to 0 or 1 or 2.

A non-AP STA that has successfully set up a peer-to-peer TWT schedule with its associated

AP should use the negotiated peer-to-peer TWT SPs for communication not via the AP.

A non-AP STA may teardown a peer-to-peer TWT agreement by sending a TWT Teardown frame

with the Negotiation Type subfield set to 0 and the TWT Flow Identifier field set to the value of the

corresponding TWT flow identifier.

NOTE 3—If the Next TWT subfield is present in the TWT Information frame, the peer-to-peer TWT agreement will

resume at the time indicated in the Next TWT subfield.

A non-AP STA may suspend a peer-to-peer TWT agreement by sending a TWT Information frame

with the TWT Flow Identifier field set to the value of the TWT Flow Identifier field of the TWT element in the

Channel Usage Response frame that concluded the setup of the corresponding peer-to-peer TWT agreement if

the AP has set the TWT Information Frame Disabled field to 0 in the TWT element sent during the TWT setup;

otherwise, the non-AP STA shall not transmit a TWT Information frame to the AP. If the Next TWT subfield is

present in the TWT Information frame, the value of the Next TWT subfield shall be selected from existing

TWT values for the peer-to-peer TWT agreement.

NOTE 4—If the Next TWT subfield is present in the TWT Information frame, the peer-to-peer TWT agreement will resume at the time indicated in the Next TWT subfield.

Upon receipt of a Channel Usage element in the Probe Request frame, the AP supporting channel

usage shall send a Probe Response frame including one or more Channel Usage elements. Upon receiving a

Channel Usage Request frame with the Usage Mode field set to 0 or 1, the AP supporting channel

usage shall send a Channel Usage Response frame including one or more Channel Usage elements. Channel

Usage elements shall include channels that are valid for the regulatory domain in which the AP transmitting the

element is operating and consistent with the Country element in the Beacon or Probe Response frame; the

Channel Usage elements shall not include any other channels. Upon receiving a Channel Usage

Request frame with the Usage Mode field set to 2 in a Channel Usage element, an AP that supports channel

usage shall send a Channel Usage Response frame with the Usage Mode field in the Channel Usage element set

to 2 if the AP can determine that none of the Aps belonging to the same ESS operate BSSs on the channels

indicated by the Channel Entry field in the Channel Usage element of the response. Otherwise, the AP shall set

the Usage Mode field of the Channel Usage element to 0 or 1 or 3.

NOTE 5—The determination of which Aps belonging to the same ESS operate BSSs on a particular channel is

implementation dependent and beyond the scope of this standard.

Upon receiving a Channel Usage Request frame with a TWT element, an AP that supports

peer-to-peer TWT scheduling shall send a Channel Usage Response frame including zero or

one Channel Usage element that includes a Channel Entry field with only one Operating Class and Channel

field, a TWT Elements field and may include a Timeout Interval Element field. Each TWT element carried in

the TWT Elements field includes a single Individual TWT Parameter Set field whose subfields shall be set as

described in 26.8.2 (Individual TWT agreements) except that the TWT Group Assignment subfield shall be set

to zero and the Responder PM Mode subfield, the Trigger subfield, the Flow Type subfield, and the TWT

Channel subfield shall be reserved. The TWT element(s) in the TWT Elements field apply to the

Channel Entry subfield of the Channel Usage Elements field, if present. When the lifetime of the peer-to-peer

TWT agreement expires, the AP shall send a TWT Teardown frame to terminate that peer-to-peer TWT

agreement.

NOTE 6—If the Usage Mode field set to 3, it is possible that the Channel Usage Request frame does not include a Channel Entry field. In such case, the TWT element indicates the unavailability of the requesting non-AP STA for communication with the AP during the peer-to peer TWT schedule.

The outcome of the TWT setup when negotiating a peer-to-peer TWT agreement initiated by the exchange of Channel Usage Request and Channel Usage Response frames that carry a TWT element as described in this clause is the same as that defined in Table 10-40 (TWT setup exchange command interpretation(11ax)).

The AP shall not send an unsolicited Channel Usage Response frame with a TWT element to a non-AP STA.

An AP that successfully sets up a peer-to-peer TWT agreement after receiving a Channel Usage Request frame with a TWT Elements field from a non-AP STA may indicate the lifetime of the peer-to-peer TWT agreement for the corresponding TWT element(s) in the Timeout Interval Value field of the TIE that it includes in the Channel Usage Response frame and shall set the corresponding Timeout Interval Type field to 5. An AP that successfully sets up a peer-to-peer TWT agreement shall consider the non-AP STA to be in power save mode and doze state: (#6128, #6129)

1. at the start of the peer-to-peer TWT SP, or
2. after the non-AP STA has completed a frame transmission to the AP within the SP that started before the SP, or
3. after the transmission of an expected control response frame by the non-AP STA in the SP in response to a frame transmission that started before the SP, or
4. after the transmission of a TB PPDU by the non-AP STA in the SP in response to a Trigger frame that was transmitted before the start of the SP.

NOTE - If the associated AP Initiates a TXOP with the non-AP STA as the TXOP responder before the peer-to-peer TWT SP, and if the TXOP ends within the peer-to-peer TWT SP, the non-AP STA might not be able to be available and continue transmission and reception after the start of the peer-to-peer TWT SP.

The non-AP STA is back to its original power management mode at the end of the peer-to-peer TWT SP unless the AP receives a frame other than an expected response frame mentioned in item c) above addressed to it from the non-AP STA within the time that overlaps with the peer-to-peer TWT SP.

(#6128) An AP shall transmit a control response frame to a previously received frame from a non-AP STA in a TXOP that started before the start of the peer-to-peer TWT SP even if the control response frame transmission overlaps a peer-to-peer TWT SP of the transmitting STA. The AP shall consider the non-AP STA to be in power save mode and doze state after the transmission of the control response frame.

Upon receiving a Channel Usage Request frame with a TWT element configured as a TWT request and

a Channel Usage element with the Usage Mode field set to 3 (Peer-to-peer link) that does not carry a Channel

Entry field, an AP that supports peer-to-peer TWT scheduling shall transmit a Channel Usage Response frame

that includes a Channel Usage element without a Channel Entry field and a TWT element configured as a TWT

response (i.e., TWT Request field set to 0) with a TWT Setup Command field indicating Accept TWT and all

other fields of that TWT element set to the same value as the fields of the TWT element carried in the Channel

Usage Request frame. In this case, the Timeout Interval Value field of the TIE, if any, in the Channel Usage

Response frame includes the same value as that of the Channel Usage Request frame.

When the Channel Usage element in a received Probe Request or Channel Usage Request frame includes one

or more Operating Class/Channel Pair fields, the Operating Class/Channel Pair field(s) indicate(s) the

requested non-AP STA operating class/channels for the usage mode indicated in the frame. If the Usage Mode field in the Channel Usage element carries a value that is unknown to the AP, the AP should send in the Probe Response or Channel Usage Response frame a Channel Usage element without a Channel Entry field and with a Usage Mode field value indicating Unknown request, to inform the client that the AP does not support the usage mode indicated in the request. Usage mode Unknown request shall not be used in a Probe Request frame, in a Channel Usage Request frame, or in a Channel Usage Response frame that is sent in response to a Channel Usage Request frame that includes a Channel Usage element with usage modes 0 to 3.

The AP may send an unsolicited group addressed or individually addressed Channel Usage Response frame to

the STAs that have requested channel usage information if the corresponding channel usage

information needs to be updated. The Country element shall be included in the unsolicited and/or group

addressed Channel Usage Response frame. The AP may include the Power Constraint information and EDCA

Parameter in the Channel Usage Response frame. The values of the fields in the Power Constraint and EDCA

Parameter Set elements included in the Channel Usage Response frame shall be the same values of the fields in

the Power Constraint and EDCA Parameter Set elements that are transmitted by the AP.

Upon receipt of a Channel Usage element (#6135) with the Channel Usage field set to 0, 1 or 2 in the Probe Response or Channel Usage Response frame, the receiving STA may use the following:

— The channel usage information as part of channel selection processing to start a

noninfrastructure BSS or an off-channel TDLS direct link

— The Power Constraint element, if present, as part of determining its maximum transmit power for

transmissions for the noninfrastructure BSS or an off-channel TDLS direct link

— The EDCA Parameter Set element, if present, as part of determining its EDCA parameters for

transmissions for the noninfrastructure BSS or an off-channel TDLS direct link

— The QMF Policy element, if present and dot11QMFActivated is true, as part of determining its

classification of Management frames for transmissions for the noninfrastructure BSS or an

off-channel TDLS direct link

A non-AP STA that is operating in a noninfrastructure BSS may send a Channel Usage Request frame with a Channel Usage element that carries a Usage Mode field with a value equal to 4 to a peer STA to indicate  that it prefers to switch the operating channel of the noninfrastructure BSS to another channel. A non-AP STA may indicate the preferred operating channels by including one or more Operating class and Channel fields in the Channel Entry field of the Channel Usage element carried in the corresponding Channel Usage Request frame.

Upon receiving a Channel Usage Request frame with a Channel Usage element that carries a Usage Mode field with a value equal to 4, a STA that supports noninfrastructure BSS channel switch requests and is BSS to a new channel that is one of the preferred channels indicated in the received Channel Entry field of the Channel Usage element, if present. The STA shall transmit a Channel Usage Response frame in response to the reception of a Channel Usage Request frame with the Usage Mode field equal to 4 that includes a Channel Usage element with the Usage Mode field set to 4. If the channel switch request is accepted, the STA shall Channel Usage Response frame. Otherwise, no Channel Entry field shall be included. When the Channel Usage element is carried in a Probe Request or Probe Response frame, the Usage Mode field shall not be set to 4.

If either a recommended operating class, or a recommended channel, or both are not supported or understood

by the recipient, or if the operating country of the sender is unknown, the recipient shall discard the

corresponding channel usage recommendation. A STA that has not requested channel usage

information shall discard an unsolicited group addressed Channel Usage Response frame.

**CID 6130:**

**Discussion:**

It is likely that unicast management frames sent by a non-AP HE STA before association to an AP fail because of collision or hidden node activity at the AP, which may lead to potential block-listing of the AP by the non-AP HE STA. The AP may use leverage the "TXOP Duration RTS Threshold" subfield to require a non-AP HE STA to send RTS before transmitting unicast management frames (unicast Probe Request, Association Request frames, etc.).

Note that the normative text in 26.2.1 specifics the behaviour for a non-AP HE STA regardless of the association state. See the text below from 11me D4.0, **26.2.1 TXOP duration-based RTS/CTS**:

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**Proposed Normative Text**

***TGme editor, please remove the strikethrough text in the following text:***

**9.2.4.248 HE Operation Element**

**…**

The TXOP Duration RTS Threshold subfield enables an HE AP to manage RTS/CTS usage by non-AP HE STAs (#6130) ~~that are associated with it~~ (see 26.2.1 (TXOP duration-based RTS/CTS)). The TXOP Duration RTS Threshold subfield contains the TXOP duration RTS threshold in units of 32 μs, which enables the use of RTS/CTS, except for the value 1023. The value 1023 indicates that TXOP duration-based RTS is disabled. The value of 0 is allowed in Beacon and Probe Response frames and indicates that the previously announced TXOP duration RTS threshold remains in effect. In all other frames, the value of 0 is reserved.