IEEE P802.11
Wireless LANs

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| LB270: Resolution for MICS CIDs |
| Date: 2023-03-01 |
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|  |  |  |  |  |

Abstract

This submission proposes resolution for CIDs received in LB270 (REVme D2.0):

***TGm editor: The baseline for this document is REVme D2.0.***

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause**  | **Page** | **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 3052 | Emily Qi | 11.21.15 | 2603 | 19 | If the off-channel transmissions are for "noninfrastructure network communication", why do we need "that does not involve its associated AP"? In other words, if it is noninfrastructure, then by default there would be no AP involved. As it reads, this rule appears to apply to all non noninfrastructure links that a STA has irrespective of which channel it is. Shouldn't it be more specific? For example "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP shall use the off-channel TWT SPs for noninfrastructure network communication that takes place on the channel specified on the negotiated off-channel TWT schedule". | Change "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP shalluse the off-channel TWT SPs for noninfrastructure network communication that does not involve its associatedAP." to "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP shall use the off-channel TWT SPs for noninfrastructure network communication that takes place on the channel specified on the negotiated off-channel TWT schedule". | **Revised**Agree in principle, we revise the cited sentence based on the suggestion of the commenter.**TGm editor, please implement changes as shown in 0161r1 tagged as 3052** |
| 3147 | Laurent Cariou | 11.21.15 | 2603 | 19 | Regarding the sentence: "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP, shall use the off-channel TWT SPs for non -infrastruture network communication that does not involve its associated AP". I think the sentence should be rephrased to have some meaning. The non-AP STA will operate during that time on another channel so the off-channel TWT SP doesn't really have any sense for the non-AP STA and even less for the AP as it is not operating on that off-channel. What I understand would be the intention here is simply to say that the AP will now know that the non-AP STA will be unavailable during the time of the SP (because it will be operating on the off-channel), and therefore needs to consider that the non-AP STA is unavailable during the TWT SP. | Change the sentence by something like the following: The AP shall consider the non-AP STA as being unavailable (as being in power save mode and doze state) during the off-channel TWT service periods. And remove strong requirement on the client side, otherwise, no STA will ever use that mechanism | **Revised**Agree in principle, we revise the cited sentence to be consistent with the revised sentence based on CID 3156. Same resolution as CID 3052.**TGm editor, please implement changes as shown in 0161r1 tagged as 3052** |
| 3063 | James Yee | 11.21.15 | 2603 | 19 | The behavior mandated in "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP shall use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP." is unnecessary since the purpose of the Channel Usage procedure is to provide guidance information that is not required to be followed by an non-AP STA. Please change the "shall" to a "may". | Change to "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP may use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP." | **Revised** Agree in principle, we revise the cited sentence to be consistent with the revised sentence based on CID 3156. This means that the non-AP STA will use that TWT SP for non-infrastructure communication unless it indicates otherwise to its AP. Same resolution as CID 3052.**TGm editor, please implement changes as shown in 0161r1 tagged as 3052** |
| 3801 | Yongho Seok | 11.21.15 | 2603 | 19 | "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP shall use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP."This is conflicted with the goal of the Channel Usage procedure in current spec.The following is a brief summary of the Channel Usage procedure.- Channel usage information is provided by the AP to the non-AP STA to recommend channels for BSSs that are not infrastructure BSSs or an off-channel TDLS direct link.- The non-AP STAs can use the channel usage information as part of channel selection processing for a BSS that is not an infrastructure BSS or an offchannel TDLS direct link.- The 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.Since the Channel Usage procedure purpose is to provide a guidance information that is not required to be followed by an non-AP STA, please remove "shall" int he cited sentence. | Change to "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP may use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP."Otherwise, remove this off-channel TWT featrue. | **Revised** Agree in principle, we revise the cited sentence to be consistent with the revised sentence based on CID 3156. This means that the non-AP STA will use that TWT SP for non-infrastructure communication unless it indicates otherwise to its AP. Same resolution as CID 3052.**TGm editor, please implement changes as shown in 0161r1 tagged as 3052** |
| 3802 | Yongho Seok | 11.21.15 | 2603 | 19 | "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP shall use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP."This sentence is conflicted with the following:"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."If the operating class, or operating channel, or both are not supported, the recipient can't follow the off-channel TWT SPs. | Change to "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP may use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP."Otherwise, remove this off-channel TWT featrue. | **Revised**Agree in principle, we revise the cited sentence to be consistent with the revised sentence based on CID 3156. This means that the non-AP STA will use that TWT SP for non-infrastructure communication unless it indicates otherwise to its AP. Same resolution as CID 3052.**TGm editor, please implement changes as shown in 0161r1 tagged as 3052.** |
| 3039 | Chien-Fang Hsu | 11.21.15 | 2603 | 19 | The Channel Usage procedure is to provide information for reference so that is not necessary to be followed by a non-AP STA. | Please replace "shall" by "may" in the cited sentence. | **Revised** Agree in principle, we revise the cited sentence to be consistent with the revised sentence based on CID 3156. This means that the non-AP STA will use that TWT SP for non-infrastructure communication unless it indicates otherwise to its AP. Same resolution as CID 3052.**TGm editor, please implement changes as shown in 0161r1 tagged as 3052** |
| 3158 | Li-Hsiang Sun | 11.21.15 | 2603 | 19 | "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP shall use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP."This is conflicted with the goal of the Channel Usage procedure in current spec.The following is a brief summary of the Channel Usage procedure.- Channel usage information is provided by the AP to the non-AP STA to recommend channels for BSSs that are not infrastructure BSSs or an off-channel TDLS direct link.- The non-AP STAs can use the channel usage information as part of channel selection processing for a BSS that is not an infrastructure BSS or an offchannel TDLS direct link.- The 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.Since the Channel Usage procedure purpose is to provide a guidance information that is not required to be followed by an non-AP STA, please remove "shall" int he cited sentence. | Change to "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP may use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP."Otherwise, remove this off-channel TWT featrue. | **Revised** Agree in principle, we revise the cited sentence to be consistent with the revised sentence based on CID 3156. This means that the non-AP STA will use that TWT SP for non-infrastructure communication unless it indicates otherwise to its AP. Same resolution as CID 3052.**TGm editor, please implement changes as shown in 0161r1 tagged as 3052** |
| 3150 | Laurent Cariou | 11.21.15 | 2602 | 52 | "Supports providing" is not accurate. The AP in this procedure is not providing a schedule, it is just acknowledging a schedule defined and proposed by the non-AP STA. | Change "supports providing" to something like "supports understanding" | **Revised**We clarify the cited sentence; however, a client may request a schedule that is already in use by another STA, hence, to ensure efficiency of medium utilization, for some modes an AP may provide an alternative schedule and not necessarily acknowledge a schedule proposed by the non-AP STA.**TGm editor, please implement changes as shown in 0161r1 tagged as 3150** |
| 3145 | Laurent Cariou | 11.21.15 | 2603 | 16 | There could be no "channel entry" in the request frame. Clarify if that condition is possible. | as in comment | **Revised**Agree in principle, in clause 9.4.2.85 its mentioned on P1119L25 that “The Channel Entry field includes zero or more Operating Class and Channel fields.” Hence, we clarify in clause 9.4.2.85 and 11.21.15.**TGm editor, please implement changes as shown in 0161r1 tagged as 3145** |
| 3156 | Laurent Cariou | 11.21.15 | 2603 | 56 | Simplify the sentence to say that the AP shall consider the non-AP STA to be in power save mode and doze state at the start of the off-channel TWT SP and back to its original power management mode and state at the end of the off channel TWT SP. That is really what is meant by this sentence and that is really the goal of this whole off-channel TWT procedure. | as in comment | **Revised**Agree in principle, we revise the cited sentence based on the suggestion of the commenter.**TGm editor, please implement changes as shown in 0161r2 tagged as 3156** |
| 3148 | Laurent Cariou | 11.21.15 | 2603 | 19 | How is it set up. Clearly, this is only proposed by the non-AP STA and the AP can just accept it or maybe suggest something else. As it is, the AP can not change timing parameters or initiate a TWT negotiation (only STA initiated), which makes sense. Please clarify the behavior on the AP side and clarify that the AP can either Accept the proposed TWT parameters or suggest an alternative. If it suggests an alternative, no TWT schedules are established and the non-AP STA has to request again with possibly different parameters. | as in comment | **Revised**Agree in principle. We clarify the setup procedure between the AP and the non-AP STA.**TGm editor, please implement changes as shown in 0161r2 tagged as 3148.** |
| 3157 | Laurent Cariou | 11.21.15 | 2603 | 56 | Need a way for the non-AP STA to inform the AP that the off-channel TWT is no longer true (tear down) or updated. | as in comment | **Revised**Agree in principle. We clarify how a non-AP STA may suspend or teardown that TWT agreement.**TGm editor, please implement changes as shown in 0161r1 tagged as 3157** |
| 3045 | Dibakar Das | 11.21.15 | 2604 | 1 | How does an AP or STA explicitly tear down the TWT SP that was set up ? | Define the signaling for an AP or STA to teardown a previously reccomended off-channel TWT SP. | **Revised**Agree in principle. We clarify that an AP or non-AP STA may teardown that TWT agreement by sending a TWT Teardown frame.Same resolution as CID 3157**TGm editor, please implement changes as shown in 0161r1 tagged as 3157** |
| 3159 | Li-Hsiang Sun | 11.21.15 | 2603 | 19 | "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP shall use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP."This sentence is conflicted with the following:"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."If the operating class, or operating channel, or both are not supported, the recipient can't follow the off-channel TWT SPs. | Change to "A non-AP STA that has successfully set up an off-channel TWT schedule with its associated AP may use the off-channel TWT SPs for noninfrastructure network communication that does not involve its associated AP."Otherwise, remove this off-channel TWT featrue. | **Revised**We clarify the setup procedure between the AP and the non-AP STA.Also, we clarify in resolution of 3157 that a STA may teardown the agreement by sending a TWT teardown frame.**TGm editor, please implement changes as shown in 0161r2 tagged as 3148.** |
| 3152 | Laurent Cariou | 11.21.15 | 2604 | 1 | Clarify that the AP shall not send unsolicited Channel Usage Response with a TWT element | as in comment | **Revised**Agree in principle, we add a sentence to clarify that the AP shall not send unsolicited Channel Usage Response frame with a TWT element**TGm editor, please implement changes as shown in 0161r1 tagged as 3152** |
| 3390 | Mark RISON | 9.6.13.25 |  |  | "The Timeout Interval Element field is present when the TWT Elements field contains at least one TWT element. " -- OK, but what does this field actually contain? | Add before the full stop "; if present it contains a TIE" and at the end of the para change "Timeout Interval Element field" to "TIE" | **Accepted****TGm editor, please implement changes as shown in 0161r1 tagged as 3390** |
| 3155 | Laurent Cariou | 11.21.15 | 2603 | 53 | Why is the AP setting a lifetime for the TWT agreement? Again, this is initiated by the non-AP STA so that STA is the one controlling all this, including the lifetime of the agreement. | Suppress the lifetime element from the Response, maybe include it in the request instead, if really needed. | **Revised**Based on the suggestion of the commenter, we add the TIE element in the request so that the requesting STA can indicate the lifetime of the schedule and clarify its use.**TGm editor, please implement changes as shown in 0161r2 tagged as 3155** |
| 3146 | Laurent Cariou | 11.21.15 | 2603 | 16 | Why can there be more than one TWT element. If it is to define a range of TWT timing information as described in baseline, this needs to be indicated. Otherwise, there should be only one TWT element. | as in comment | **Revised**Agree in principle, we simplify the protocol to allow a non-AP STA to indicate to the AP a range of TWT parameters by including two TWT elements, otherwise the non-AP STA includes one TWT element. Similarly for the AP in the Channel Usage Response frame.**TGm editor, please implement changes as shown in 0161r1 tagged as 3146** |

Discussion:





**9.4.2.85 Channel Usage element**

***TGm editor: Please update Table 9-265 in this subclause as shown below:***

Table 9-265—Usage Mode definitions [3145]

|  |  |
| --- | --- |
| **Value** | **Usage Mode** |
| 0 | Noninfrastructure IEEE 802.11 network |
| 1 | Off-channel TDLS direct link |
| 2 | Noninfrastructure IEEE 802.11 network in which none of the APs belonging to the same ESS operate on the channels identified by the Channel Entry field |
| 3 | Peer-to-peer link indication |
| 4-255 | Reserved |

**9.6.13.24 Channel Usage Request frame format**

***TGm editor: Please note that there is no change to the following paragraph, added for discussion only:***

The Channel Usage Request frame is sent by a non-AP STA to the AP to request the specified Channel

Usage information. The format of the Channel Usage Request frame Action field is defined in Figure 9-1174 (Channel Usage Request frame Action field format)

***TGm editor: Please update Figure 9-1174 in this subclause as shown below:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|   | Category | WNMAction | Dialog Token | Channel Usage Elements | Supported Operating Classes Element | TWT Elements(optional) | Timeout Interval Element(optional) |
| **Octets:** | 1 | 1 | 1 | variable  | variable | variable | 0 or 7 |

Figure 9-1174 — Channel Usage Request frame Action field format[3155]

***TGm editor: Please modify the following paragraph in this subclause as shown below:***

The TWT Elements field includes zero or more TWT elements each containing only one individual TWT parameter set (see Figure 9-765 (Individual TWT Parameter Set field format(11ax))). (#3146) When included in a Channel Usage Request frame, the TWT Elements field contains only one TWT element, except if used for the establishment of a peer-to-peer TWT agreement with a range of TWT parameter values (see 10.47.9 (TWT parameter ranges)). In this case, an additional TWT element is present. The subfields of the Individual TWT Parameter Set field are set as described in 11.21.15 (Channel usage procedures).

(#3155) The Timeout Interval Element field is present when the TWT Elements field contains at least one TWT element; if present it contains a TIE. Otherwise, the Timeout Interval Element field is not present in this frame. The subfields of the TIE are set as described in 11.21.15 (Channel usage procedures).

**9.6.13.25 Channel Usage Response frame format**

***TGm editor: Please note that there is no change to the following paragraph, added for discussion only:***

The Channel Usage Response frame is sent by an AP in response to a Channel Usage Request frame, or autonomously. The format of the Channel Usage Response frame Action field is shown in Figure 9-1175 (Channel Usage Response frame Action field format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|   | Category | WNMAction | Channel Usage Elements | Country String | Power Constraint Element (optional) | EDCA Parameter Set Element (optional) |
| **Octets:** | 1 | 1 | variable  | 3 | 0 or 3 | variable |
|  |  |  |  |  |  |  |
|  | Transmit Power Envelope Element (optional) | TWT Elements(optional) | Timeout Interval Element(optional) |
| **Octets:** | variable | variable | 0 or 7 |  |  |  |

Figure 9-1175—Channel Usage Response frame Action field format

***TGm editor: Please modify the following paragraphs in this subclause as shown below:***

The TWT Elements field includes zero or more TWT elements each containing only one individual TWT parameter set (see Figure 9-765 (Individual TWT Parameter Set field format)). (#3146) When included in a Channel Usage Response frame, the TWT Elements field contains only one TWT element, except if used for the establishment of a peer-to-peer TWT agreement with a range of TWT parameter values (see 10.47.9 (TWT parameter ranges)). In this case, an additional TWT element is present. The subfields values of the Individual TWT Parameter Set field are set as described in 11.21.15 (Channel usage procedures).

(#3390) The Timeout Interval Element field is present when the TWT Elements field contains at least one TWT element; if present it contains a TIE. Otherwise, the Timeout Interval Element field is not present in this frame. (#3390) The subfields of the TIE are set as described in 11.21.15 (Channel usage procedures).

**9.4.2.48 TIE**

***TGm editor: Please update Table 9-219 in this subclause as shown below:***

**Table 9-219 – Timeout Interval Type field value** [3150]

|  |  |  |
| --- | --- | --- |
| **Timeout Interval Type** | **Meaning** | **Units** |
| 0 | Reserved |  |
| 1 | Reassociation deadline interval | Time Units (TUs) |
| 2 | Key lifetime interval | Seconds |
| 3 | Association Comeback time | Time Units (TUs) |
| 4 | Time-to-Start (see 11.31.3.1 (General)) | Time Units (TUs) |
| 5 | Peer-to-peer TWT agreement lifetime | Time Units (TUs) |
| 6-255 | Reserved |  |

**9.4.2.26 Extended Capabilities element**

***TGm editor: Please update Table 9-190 in this subclause as shown below:***

**Table 9-190—Extended Capabilities field** [3150]

|  |  |  |
| --- | --- | --- |
| **Bit** | **Information** | **Notes** |
| <Last assigned +1> | Peer-to-peer TWT Support | Set to 1 to indicate support for reception of a Channel Usage Request frame that includes one or more TWT elements |
| <Last assigned + 2> - *n* | Reserved |  |

**11.21.15 Channel usage procedures**

***TGm editor: Please update this subclause as shown below:***

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

noninfrastructure network or an off-channel TDLS direct link. The 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.

(#3145) 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 (#3150)a peer-to-peer TWT agreement and the corresponding TWT schedules are referred to as (#3150)peer-to-peer TWT schedules. (#3145) 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.

(#3148) Unless explicitly indicated in this subclause, the rules defined in 10.47 (Target Wake Time (TWT)) and in 26.8 (TWT operation) shall be ignored when establishing and operating with a peer-to-peer TWT agreement.

NOTE – 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.

(#3150) 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 non-infrastructure network or an off-channel TDLS direct link shall set to 1 the Peer-to-peer TWT Support field of the Extended Capabilities elements that it transmits.

NOTE 1—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

network 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 network 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 (#3145) 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 (#3150)a peer-to-peer TWT schedule with its associated AP, (#3155) to indicate the service period, and optionally the channel operation, of a noninfrastructure network 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 (#3150)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) (#3155) and 9.4.2.199 (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. (#3155) 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.

(#3148) 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 peer-to-peer TWT agreement.

(#3145) 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 (#3050) a peer-to-peer TWT schedule with its associated AP (#3052)shoulduse the negotiated (#3050)peer-to-peer TWT SPs for noninfrastructure network communication(#3052) . (#3157) 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.

(#3157) A non-AP STA may suspend apeer-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- 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 (#3145)0 or 1 or 3.

NOTE 2—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 (#3050)peer-to-peer TWT scheduling shall send a Channel Usage Response frame including (#3145) 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. (#3155) The TWT element(s) in the TWT Elements field apply to the Channel Entry subfield of the Channel Usage Elements field, if ~~any~~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.

(#3145) NOTE – 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.

(#3148) 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).

(#3152) 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 (#3150) a peer-to-peer TWT agreement (#3146) after receiving a Channel Usage Request frame with a TWT Elements field from a non-AP STA may indicate the lifetime of the (#3150) peer-to-peer TWT agreement for the corresponding TWT element(s) in the Timeout Interval Value field of the (#3146)TIEthat 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 (#3150) a peer-to-peer TWT agreement (#3156)shall consider the non-AP STA to be in power save mode and doze state at the start of the peer-to-peer TWT SP and back to its original power management mode at the end of the peer-to-peer TWT SP unless the AP receives a frame addressed to it from the non-AP STA within the time that overlaps with the peer-to-peer TWT SP.

(#3145) 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.

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 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 network 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 network 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 network 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 network or an off-channel TDLS direct link

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.