IEEE P802.11
Wireless LANs

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| Proposed Resolution for SB1 CID 6018 and more |
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Abstract

##### This submission provides proposed resolutions for CID 6018, 6028 and 6029.

##### The proposed changes are based on REVme D4.1

##### Revision history:

##### R0 – initial version

| **CID** | **Page** | **Clause** | **Resn Status** | **Comment** | **Proposed Change** |
| --- | --- | --- | --- | --- | --- |
| 6018 (MAC) | 1125.50 | 9.4.2.84 |  | "Peer-to-peer link indication" is not only used for P2P link indication, but also used for any off-channel and off-link operation indication. The term "Peer-to-peer link indication" can be changed to a broader name. It is actually an unavailability indication (i.e., unavailable to infrastructure BSS) | Change "Peer-to-peer link indication" to "Unavailability indication".  |
| 6029 (MAC) | 993.40 | 9.4.2.24 |  | "Peer-to-peer TWT" support is not only used for P2P link indication, but also used for any off-channel and off-link operation indication (e.g., off-channel scanning). The term ""Peer-to-peer TWT" can be changed to a broader name. "Peer-to-peer TWT" is an unavailability schedule (i.e., unavailable to infrastructure BSS).  | Change "Peer-to-peer TWT Support" to "Unavailability Support"; Change "Peer-to-peer TWT schedule(ing)" to "Unavailability schedule(ing)"; Change "Peer-to-peer TWT agreement" to "Unavailability notification". Change "Peer-to-peer TWT SP" to "Unavailability period", globally, clone case. |
| 6028 (MAC) | 1648.62 | 9.6.13.24 |  | "except if used for the establishment of a peer-to-peer TWT agreement with a range of TWT parameter values". "establishment" is redundant. Remove "the establishment of". | remove "the establishment of” at 1648.62 and 1649.49. |

**Background:**

“Peer-to-peer link indication” and “Peer-to-peer TWT support” used to be called: “Off-channel link indication” and “Off-channel TWT support”. They were renamed to “Peer-to-peer link indication” and “Peer-to-peer TWT support” since they can be used for “peer-to-peer” operation. The recent discussion from other activities suggested that those indication and support be also used for Bluetooth coexistence and time domain multiplexing in addition to off channel scanning and peer-to-peer operations. Naming them “Peer-to-peer” might cause some confusion.

Those comments suggest changing “Peer-to-peer TWT xxx” to “Unavailability xxx”.

**Proposed Resolutions for CID 6018, 6028 and 6029:**

Revised. Incorporate changes in this document under “Proposed Changes”.

**Proposed Changes:**

**9.4.2.25 Extended Capabilities element**

***TGm editor: Please update the following row in Table 9-192 (Extended Capabilities field) as shown below:***

|  |  |  |
| --- | --- | --- |
| 100  | Unavailability Support(#3150) | Set to 1 to indicate support for reception of a Channel Usage Request frame that includes one or more TWT elements. Set to 0 otherwise.(#3388) |

* TIE(#1776)

***TGm editor: Please update Table 9-220 (Timeout Interval Type field value) in this subclause as shown below:***

|  |
| --- |
| * Timeout Interval Type field value
 |
| 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) |
| (#1024)5 | Unavailability notification lifetime | Time units (TUs) |
| (#1024)6–255 | Reserved |  |

**9.4.2.84 Channel Usage element**

***TGm editor: Please modify Table 9-268 (Usage Mode definitions) in this subclause as shown below:***

|  |
| --- |
| Table 9- 268 Usage Mode definitions |
| Value  | Usage Mode |
| 0 | Noninfrastructure BSS |
| 1 | Off-channel TDLS direct link |
| 2 | Noninfrastructure BSS in which none of the APs belonging to the same ESS operate on the channels identified by the Channel Entry field |
| 3 | Unavailability indication |
| 4 | Noninfrastructure BSS channel switch request |
| 5–254 | Reserved |
| 255 | Unknown request |

* Channel Usage Request frame format

***TGm editor: Please change 9.6.13.24 as shown below:***

The Channel Usage Request frame is sent by a non-AP STA to the AP to request the specified (#3311)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).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Category | WNM Action | Dialog Token | Channel Usage Elements | Supported Operating Classes Element | TWT Elements (optional)(#1024) | Timeout Interval Element (optional)(#3155) |
| Octets: | 1 | 1 | 1 | variable | variable | variable | 0 or 7 |
| * Channel Usage Request frame Action field format
 |

The Category field is defined in 9.4.1.11 (Action field).

The WNM Action field is defined in 9.6.13.1 (WNM Action field(#3729)).

(#417)The Dialog Token field is defined in 9.4.1.12 (Dialog Token field). It is a nonzero value chosen by the non-AP STA sending the Channel Usage Request frame to identify the request/response transaction.

The Supported Operating Classes Element field contains a Supported Operating Classes element to indicate the supported operating classes for the requested network type, consistent with the Country element advertised by the AP. The Supported Operating Classes is described in 9.4.2.52 (Supported Operating Classes element).

(#1024)The TWT Elements field includes zero or more TWT elements each containing only one individual TWT parameter set (see Figure 9-760 (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 unavailability notification with a range of TWT parameter values (see 10.46.9 (TWT parameter ranges(11ax))). 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).

* Channel Usage Response frame format

***TGm editor: Please change 9.6.13.25 as shown below:***

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 | WNM Action | Dialog Token | Channel Usage Elements | Country String  | Power Constraint Element (optional) | EDCA Parameter Set Element (optional) |  Transmit Power Envelope element (optional) |  TWT Elements(optional)(#1024) |  Timeout Interval Element (optional)(#1024) |
| Octets: | 1 | 1 | 1 | variable |  3 | 0 or 3 | 0 or 20 | variable | variable | 0 or 7 |

The Category field is defined in 9.4.1.11 (Action field).

The WNM Action field is defined in 9.6.13.1 (WNM Action field(#3729)).

(#417)The Dialog Token field is defined in 9.4.1.12 (Dialog Token field). It is the nonzero value received in the Channel Usage Request frame if the Channel Usage Response frame is being transmitted in response to a Channel Usage Request frame. The Dialog Token field is 0 if the Channel Usage Response frame is being transmitted other than in response to a Channel Usage Request frame.

The Channel Usage Element field includes zero or more Channel Usage elements described in 9.4.2.84 (Channel Usage element).

The Country String field is the value contained in the dot11CountryString attribute.

The Power Constraint Element field includes zero or one Power Constraint elements described in 9.4.2.12 (Power Constraint element). The use of the Power Constraint element included in the Power Constraint Element field is described in 11.21.15 (Channel usage procedures).

The EDCA Parameter Set Element field includes zero or one EDCA Parameter Set elements described in 9.4.2.27 (EDCA Parameter Set element). The use of the EDCA Parameter Set element included in the EDCA Parameter Set Element field is described in 11.21.15 (Channel usage procedures).

The Transmit Power Envelope element field is defined in 9.4.2.160 (Transmit Power Envelope element).

(#1024)The TWT Elements field includes zero or more TWT elements each containing only one individual TWT parameter set (see Figure 9-760 (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 unavailability notification with a range of TWT parameter values (see 10.46.9 (TWT parameter ranges(11ax))). 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).

(#1024)The Timeout Interval Element field is present when the TWT Elements field contains at least one TWT element; if present it contains a TIE(#3390). Otherwise, the Timeout Interval Element field is not present in this frame. The subfields of the TIE(#3390) are set as described in 11.21.15 (Channel usage procedures).

**11.21.15 Channel usage procedures**

***TGm editor: please change the following paragraphs as shown below:***

The channel usage procedures may be used to assist the STA that operates a noninfrastructure BSS(#3349) or an off-channel TDLS direct link to better coexist with the infrastructure network by exchanging Channel Usage Request and Response frames.(#3311)(#4009)

Implementation of (#3311)channel usage is optional for a WNM STA. A STA that implements (#3311)channel usage has dot11ChannelUsageImplemented equal to true. When dot11ChannelUsageImplemented is true, dot11WirelessManagementImplemented shall be true, or the STA shall support(#546) 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.

(#1024)(#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)an unavailability notification and the corresponding TWT schedules are referred to as (#3150) unavailability 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 10.46 (Target wake time (TWT)) and in 26.8 (TWT operation) shall be ignored when establishing and operating with an unavailability notification.

NOTE 1—The TWT element is used for an unavailability notification only to determine the timing parameters of the unavailability schedule.

(#3150)An HE AP that has dot11ChannelUsageActivated equal to true and supports negotiating an unavailability schedule that is requested by a non-AP STA to establish a noninfrastructure BSS(#3349) or an off-channel TDLS direct link shall set to 1 the (#3022)Unavailability Support field of the Extended Capabilities elements that it transmits.

(#1024)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 (#3311)channel usage and is not associated to an AP prior to using a noninfrastructure BSS(#3349) 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 (#3311)channel usage may send a Channel Usage Request frame at any time after association to the AP that supports the use of (#3311)channel usage to request the (#3311)channel usage information for supported operating classes. (#1024)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(#3349) 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 (#4337)0, 1 or 3.(#3145)

(#1024)A non-AP STA that supports channel usage and has the TWT Requester Support subfield set to 1 (#3391)in the HE Capabilities element that it transmits, may negotiate (#3150)an unavailability schedule with its associated AP, (#3155)to indicate up the service period, and optionally the channel operation, of a noninfrastructure BSS(#3349) 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 (#3022)(#3150)Unavailability upport 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 9.4.2.198 (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 unavailability notification 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. (#3155)

(#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 unavailability notification with the AP for the TWT flow identifier indicated in the TWT element that is carried in the Channel Usage Response frame. Otherwise, that unavailability notification has not been established. The TWT flow identifier, together with the MAC addresses of the requesting STA and the responding AP, identifies the unavailability notification.

(#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 unavailability notification. Otherwise, the non-AP STA (#4337)shall set the Usage Mode field to 0, 1 or 2.

(#1024)A non-AP STA that has successfully set up (#3150)an unavailability schedule with its associated AP should use the negotiated (#3150) unavailability periods for (#3349)(#4311)communication not via the AP.(#3052)

(#3157)A non-AP STA may teardown an unavailability notification 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—The total number of unavailability notifications and of individual TWT agreements between a non-AP STA and its AP can be up to 8, since the TWT Flow Identifier field of the TWT element comprises 3 bits.(#4010)

(#3157)A non-AP STA may suspend an unavailability notification 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 unavailability notification 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 unavailability notification.

NOTE 4—If the Next TWT subfield is present in the TWT Information frame, the unavailability notification will resume at the time indicated in the Next TWT subfield.(#3157)

Upon receipt of a Channel Usage element in the Probe Request frame, the AP supporting (#3311)channel usage shall send a Probe Response frame including one or more Channel Usage elements. Upon receiving a Channel Usage Request frame (#1024)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. (#1024)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 (#4337)0, 1 or 3. (#3145)

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.(#1024)

(#1024)Upon receiving a Channel Usage Request frame with a TWT element, an AP that supports (#3150) unavailability 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 present. When the lifetime of the unavailability notification expires, the AP shall send a TWT Teardown frame to terminate that unavailability notification.

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 unavailability schedule.(#3145)

(#3148)The outcome of the TWT setup when negotiating an unavailability notification 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)).

(#3152)The AP shall not send an unsolicited Channel Usage Response frame with a TWT element to a non-AP STA.

(#1024)An AP that successfully sets up (#3150)an unavailability notification (#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)unavailability notification for the corresponding TWT element(s) in the Timeout Interval Value field of the (#3146)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 (#3150)an unavailability notification (#3156)shall consider the non-AP STA to be in power save mode and doze state at the start of the unavailability period and back to its original power management mode at the end of the unavailability period unless the AP receives a frame addressed to it from the non-AP STA within the time that overlaps with the unavailability period.

(#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 unavailability 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. (#4006)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 (#3311)channel usage information if the corresponding (#3311)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 (#3349)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 (#3349)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(#3349) 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(#3349) or an off-channel TDLS direct link

(#4028)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.

(#4028)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 operating in a noninfrastructure BSS should consider switching the operating channel of the noninfrastructure 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 include the target operating class and channel in the Channel Entry field of the Channel Usage element in the Channel Usage Response frame. Otherwise, no Channel Entry field shall be included. (#4028)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 (#3311)channel usage information shall discard an unsolicited group addressed Channel Usage Response frame.