IEEE P802.11
Wireless LANs

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| Proposed Resolution for SB1 CID 6016 and more |
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Abstract

##### This submission provides proposed resolutions for CID 6016, 6017 and 6169.

##### The proposed changes are based on REVme D4.0.

##### Revision history:

##### R0 – initial version

| **CID** | **Page** | **Clause** | **Resn Status** | **Comment** | **Proposed Change** |
| --- | --- | --- | --- | --- | --- |
| 6017 | 1648 | 9.6.13.24 | 24 | When Channel Usage Request frame is used for channel switch request, the non-AP STA should indicate its new capabilities in a new band (e.g. VHT capabilities if originally associated with HE/HT only or HE capabilities) in the Channel Usage Request frame so that AP can non-AP STA's capabilities in the new band.  | Add VHT or HE Capabilities element in the Channel Usage Request frame when the Usage Mode is set to "Noninfrastructure BSS channel switch request". Commenter will prepare a submission. |
| 6016 | 2503.16 | 11.9 |  | When AP uses Extended Channel Switch Announcement to switch to a new band (for example, from 2.4 to 5 GHz or from 2.4/5 GHz to 6 GHz ), AP may not know its associated STA’s capabilities in the new band (e.g., VHT capability, or HE capabilities in the new band). Normally the AP would know which capabilities the STA has enabled from the association request, however in this example the STA didn't’ send VHT Cap in the 2.4 Assoc request. IEEE 802.11 Std should provide a mechanism to allow non-AP STA to advertise its VHT capability for new band without reassociation.  | Commenter will prepare a submission. |
| 6169 |  | 11.9 |  | Rules or at least guidance is needed for channel switch across bands, to cover information about operation in the new band that is not known in the old band | Emily QI expressed during a TGme session at the September F2F an intention to bring a contribution on this matter. This contribution should include a mechanism, such as use of BTM, to help STAs that are unable to operate in the new band |

**Background and Discussion**

In 11.38 VHT BSS operation, it states:

A STA for which dot11VHTOptionImplemented is true shall set dot11HighThroughputOptionImplemented to true.

In 26.17 HE BSS Operation, it states:

A STA operating in the 2.4 GHz band that sets dot11HEOptionImplemented to true shall set dot11HighThroughputOptionImplemented to true.

A STA operating in the 5 GHz or 6 GHz band that sets dot11HEOptionImplemented to true shall set both dot11VHTOptionImplemented and dot11HighThroughputOptionImplemented to true.

If dotxxxOptionImplemented is true, the xxx Capabilities element is included in the Association Request/Response frame.

According to those statements, my understandings are:

* If an HE STA operates in 2.4 GHz, it shall include HT/HE Capabilities elements in the Association Request/Response frame, but do not have VHT Capabilities element of its peer device.
* If an HE STA operates in 5 GHz or 6 GHz, it shall include all HT/VHT/HE Capabilities elements in the Association Request/Response frame.

However, even though the HT or HE Capabilities element are always included in the Association Request/Response frames, the parameters of HT or HE Capabilities element may have different configurations for different bands. For example,

* STA may not support 40 MHz on 2.4 GHz band but support 40 MHz for 5GHz band. 40 MHz related fields in the HT Capabilities element may be configured differently with different band.
* the PPE Thresholds field of the HE Capabilities element might be different between bands.

Therefore, following capabilities elements need to be communicated from STA to AP when switching band:

* VHT Capabilities element when switching from 2.4 GHz band to 5 GHz band (because it was not included in the original association frames)
* HT or HE Capabilities element when switching between bands (because they might have different configurations.)

In today’s implementation, in those scenarios, STAs do reassociation procedure after switching to a new band.

This submission is to provide a way for non-AP STA to communicate its HT/VHT/HE Capabilities for the new band to avoid reassociation procedure for the case that the security configuration is same between bands. However, if the security configurations are different between bands, the STA may have to do reassociation.

**Proposed Resolutions for CID 6016, 6017 and 6169:**

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

**Proposed Changes:**

**9.4.2.25 Extended Capabilities element**

***TGm editor: Please insert a new row in Table 9-190 (Extended Capabilities field) in this subclause as shown below:***

|  |  |  |
| --- | --- | --- |
| ANA | Capability Notification Support | Set to 1 to indicate the AP supports reception of a Channel Usage Request frame that includes capabilities elements. Set to 0 otherwise. This field is reserved for a non-AP STA. |

**9.4.2.85 Channel Usage element**

***TGm editor: Please modify Table 9-266 in this subclause as shown below:***

|  |
| --- |
| * 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 | Peer-to-peer link indication |
| 4 | Noninfrastructure BSS channel switch request |
| <ANA> | Capability notification |
| <ANA> +1 –254 | Reserved |
| 255 | Unknown request |

* Channel Usage Request frame format

***TGm editor: Please insert three new fields in Figure 9-1174 (******Channel Usage Request frame Action field format) as shown below:***

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

***TGm editor: change the following paragraph in 9.6.13.24 as follows:***

The Channel Usage Element field includes one or more Channel Usage elements described in 9.4.2.84 (Channel Usage element) to identify the request channel usage. If the Usage Mode field in a Channel Usage element indicates Noninfrastructure BSS channel switch request or Capability notification, no other Channel Usage element is included in the Channel Usage Request frame.

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). This field is not present if the Usage Mode field in the Channel Usage element is Capability notification.

***TGm editor: insert the following paragraphs at the end of 9.6.13.24:***

The HT Capabilities Element field, if present, contains an HT Capabilities element. It specifies the HT capabilities of the STA in the operating class and channel specified in the Channel Entry field of the Channel Usage element. It is optionally present when the Usage Mode field in the Channel Usage element indicates Noninfrastructure BSS channel switch request or Capability notification; not present otherwise.

The VHT Capabilities Element field, if present, contains a VHT Capabilities element. It specifies the VHT capabilities of the STA for the operating class and channel specified in the Channel Entry field of the Channel Usage element. It is optionally present when the Usage Mode field in the Channel Usage element indicates Noninfrastructure BSS channel switch request or Capability notification; not present otherwise.

The HE Capabilities Element field, if present, contains an HE Capabilities element. It specifies the HE capabilities of the STA for the operating class and channel specified in the Channel Entry field of the Channel Usage element. It is optionally present when the Usage Mode field in the Channel Usage element indicates Noninfrastructure BSS channel switch request or Capability notification; not present otherwise.

**11.21.15 Channel usage procedures**

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

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 indicating Noninfrastructure BSS channel switch request 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. To provide the parameters in the HT Capabilities element, VHT Capabilities element and/or HE Capabilities element for the preferred operating channel, the non-AP STA shall include the corresponding capabilities element(s) in the Channel Usage Request frame; otherwise, capabilities element(s) shall not be included. When the Usage Mode field indicates Noninfrastructure BSS channel switch request and any capabilities elements are included in the Channel Usage Request frame, the Channel Entry field shall include an Operating Class and Channel field that indicates the operating class and channel that the capability notification applies to.

Upon receiving a Channel Usage Request frame with a Channel Usage element that carries a Usage Mode field indicating Noninfrastructure BSS channel switch request, 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. ~~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.~~

***TGm editor: please insert the following paragraphs before the last paragraph of 11.21.15:***

An AP that has dot11ChannelUsageActivated equal to true and supports capability notification shall set the Capability Notification Support field to 1 in the Extended Capabilities elements that it transmits.

If an AP has the Capability Notification Support field set to 1 in the Extended Capabilities element, an associated non-AP STA may send a Channel Usage Request frame with the Usage Mode field indicating Capability notification in the Channel Usage element to the AP after the non-AP STA receives an Extended Channel Switch Announcement element from the AP. The HT Capabilities element, VHT Capabilities element and/or HE Capabilities element shall be included in the Channel Usage Request frame with the Usage Mode field indicating Capability notification in the Channel Usage element to provide corresponding capabilities element(s) for the new operating class and channel; otherwise, capabilities element(s) shall not be included. When the Usage Mode field indicates Capability notification, the Channel Entry field shall include an Operating Class and Channel field that indicates the operating class and channel that the capability notification applies to.

When an associated non-AP STA chooses to send a Channel Usage Request frame with the Usage Mode field indicating Capability notification in the Channel Usage element to the AP, the STA shall wait a random delay uniformly distributed in the range between 0 and 5000 µs, and then transmit the Channel Usage Request frame once any applicable conditions for transmitting are met (e.g., channel access procedures, DFS or enablement procedures).

If an AP doesn’t have the Capability Notification Support field set to 1 in the Extended Capabilities element, an associated non-AP STA shall not send a Channel Usage Request frame with the Usage Mode field indicating Capability notification in the Channel Usage element to the AP.

When the Channel Usage element is carried in a Probe Request or Probe Response frame, the Usage Mode field shall not indicate Noninfrastructure BSS channel switch request or Capability notification.