### IEEE P802.11Wireless LANs

|  |
| --- |
| 11ax Comment Resolution Misc.  |
| Date: 2020-01-20 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Zhou Lan | Broadcom | 250 Innovation Dr, San Jose, CA 95134 | (+1) 408 543 3450 | zhou.lan@broadcom.com |
| George Kondylis | Broadcom | 250 Innovation Dr, San Jose, CA 95134 |  | george.kondylis@broadcom.com |
| Po-Kai Huang | Intel |  |  |  |

Abstract

This submission proposes resolutions for comments of TGax Draft D6.0 with the following CID 24054

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Minor editorial resivon.
* Rev 2: Additional revision based on the feedback received offline
* Rev 3: Revision based on comments received offline

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 TGax D6.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax D6.0 Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 24054 | 301.28 | 11.2.6 | Under SMPS, an HE non-AP STA may switch to one receive chain under various condition that an HE AP is not aware of. It is very hard for an HE AP to react to this unpredictable behavior properly, and relying on simply failure of transmission with more than one spatial stream is not ideal. | Include a timeout scheme in the 11ax amendment such that an HE non-AP STA can only switch back to one receive chain after a timeout period starting from the time that an HE non-AP STA switch to more than one receive chain. In order to preserve the power save benefits of SMPS, the maximum allowed value of timeout shall be smaller than 15 ms. Further, since this is beneficial to an HE AP, only an HE AP shall be able to determine the timeout for an associated HE non-AP STA. To avoid designing new frame, AP should signal this in SM control field of SM power save frame defined in 9.6.11.3. B0 and B1 should be reserved or a separate SM control field from an HE AP should be defined. Finally, considering that R1 HE non-AP STA does not have this feature, a capability bit is required from an HE non-AP STA. | Revised – Agree in principle with the commenter. TGax editor to make the changes shown in 11-20/0369r3 under all headings that include CID 24054 |

**Discussion:** *None.*

**Proposed Changes to TGax D6.0:**

***TGax Editor: Modify subclause 9.4.2.247.2 HE MAC Capabilities Information field as shown below***

* HE MAC Capabilities Information field

The format of the HE MAC Capabilities Information field is defined in Figure 9-787b (HE MAC Capabilities Information field format).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 B4 | B5 B7 | B8 B9 | B10       B11 | B12       B14 |
|  | +HTC HE Support | TWT Requester Support | TWT Responder Support | Dynamic Fragmentation Support | Maximum Number Of Fragmented MSDUs/A-MSDUs Exponent | Minimum Fragment Size | Trigger Frame MAC Padding Duration | Multi-TID Aggregation Rx Support |
| Bits: | 1 | 1 | 1 | 2 | 3 | 2 | 2 | 3 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B15     B16 | B17 | B18 | B19 | B20 | B21 | B22 | B23 |
|  | HE Link Adaptation Support | All Ack Support | TRS Support | BSR Support | Broadcast TWT Support | 32-bit BA Bitmap Support | MU Cascading Support | Ack-Enabled Aggregation Support |
| Bits: | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B24 | B25 | B26 | B27    B28 | B29 | B30 | B31 | B32 |
|  | HE Dynamic SM Power Save Timeout Support(#24054) | OM Control Support | OFDMA RA Support | Maximum A-MPDU Length Exponent Extension | A-MSDU Fragmentation Support | Flexible TWT Schedule Support | Rx Control Frame To MultiBSS | BSRP BQRP A-MPDU Aggregation |
| Bits: | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B33 | B34 | B35 | B36 | B37 | B38 | B39       B41 |
|  | QTP Support | BQR Support | PSR Responder | NDP Feedback Report Support | OPS Support | A-MSDU Not Under BA In Ack-Enabled A-MPDU Support | Multi-TID Aggregation Tx Support |
| Bits: | 1 | 1 | 1 | 1 | 1 | 1 | 3 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B42 | B43 | B44 | B45 | B46 | B47 |
|  | HE Subchannel Selective Transmission Support | UL 2×996-tone RU Support | OM Control UL MU Data Disable RX Support | HE Dynamic SM Power Save | Punctured Sounding Support | HT And VHT Trigger Frame RX Support |
| Bits: | 1 | 1 | 1 | 1 | 1 | 1 |
| * HE MAC Capabilities Information field format
 |

The subfields of the HE MAC Capabilities Information field are defined in Table 9-321a (Subfields of the HE MAC Capabilities Information field).

|  |
| --- |
| * Subfields of the HE MAC Capabilities Information field
 |
| Subfield | Definition | Encoding |
| +HTC-HE Support | Indicates support for the reception of a frame that carries an HE variant HT Control field. | For a non-AP STA:Set to 1 if the STA supports reception of an HE variant HT Control field based on the description in 10.8 (HT Control field operation).Set to 0 otherwise.An AP sets the +HTC-HE Support subfield to 1. |
| TWT Requester Support | Indicates support for the role of TWT requesting STA as described in 26.8 (TWT operation)). | Set to 1 if dot11TWTOptionActivated is true and the STA supports TWT requesting STA functionality (see 26.8 (TWT operation)). Set to 0 otherwise. |
| TWT Responder Support | Indicates support for the role of TWT responder STA as described in 26.8 (TWT operation)). | Set to 1 if dot11TWTOptionActivated is true and the STA supports TWT responder STA functionality (see 26.8 (TWT operation)). Set to 0 otherwise.An AP sets the TWT Responder Support subfield to 1. |
| Dynamic Fragmentation Support | Indicates the level of dynamic fragmentation that is supported by a STA as a recipient. | Set to 0 for no support for dynamic fragmentation.Set to 1 for support for up to one dynamic fragment that is a non-A-MPDU frame, no support for dynamic fragments within an A-MPDU that does not contain an S-MPDU.Set to 2 for support for up to one dynamic fragment that is a non-A-MPDU frame and support for up to one dynamic fragment for each MSDU, each A-MSDU (if supported by the recipient) and one MMPDU (if present, see 26.6.3 (Multi-TID A-MPDU and ack-enabled single-TID A-MPDU)) within an A-MPDU that does not contain an S-MPDU.Set to 3 for support for up to one dynamic fragment that is a non-A-MPDU frame and support for up to 4 dynamic fragments for each MSDU and for each A-MSDU (if supported by the recipient) within an A-MPDU and up to one dynamic fragment for one MMPDU (if present, see 26.6.3 (Multi-TID A-MPDU and ack-enabled single-TID A-MPDU)) in an A-MPDU that does not contain an S-MPDU. |
| Maximum Number Of Fragmented MSDUs/A-MSDUs Exponent | Indicates the maximum number of fragmented MSDUs and/or A-MSDUs (if supported by the recipient) that the STA is capable of receiving concurrently. | If the Dynamic Fragmentation Support subfield is greater than 0:The maximum number of fragmented MSDUs and/or A-MSDUs, *Nmax*, defined by this field is *Nmax* = 2Maximum Number Of Fragmented MSDUs/A-MSDUs Exponent, except that a value 7 in the Maximum Number Of Fragmented MSDUs/A-MSDUs Exponent subfield indicates that there is no restriction.Reserved if the Dynamic Fragmentation Support subfield is 0. |
| Minimum Fragment Size | Indicates the minimum frame body size in octets of the first fragment of an MSDU, A-MSDU (if supported), or MMPDU that is supported by the recipient STA. | If the Dynamic Fragmentation Support subfield is greater than 0:Set to 0 to indicate no minimum frame body size.Set to 1 to indicate a minimum frame body size of 128 octets.Set to 2 to indicate a minimum frame body size of 256 octets.Set to 3 to indicate a minimum frame body size of 512 octets.Reserved if the Dynamic Fragmentation Support subfield is 0. |
| Trigger Frame MAC Padding Duration | Indicates *MinTrigProcTime*, which is used in 26.5.2.2.3 (Padding for Trigger frame or frame containing TRS Control subfield). | For a non-AP STA:Set to 0 to indicate 0.Set to 1 to indicate 8 s.Set to 2 to indicate 16 s.The value 3 is reserved.Reserved for an AP. |
| Multi-TID Aggregation Rx Support | Indicates the number of TIDs of QoS Data frames that an HE STA can receive in a multi-TID A-MPDU as described in 26.6.3 (Multi-TID A-MPDU and ack-enabled single-TID A-MPDU). | Set to the number of TIDs minus 1 of QoS Data frames that an HE STA can receive in a multi-TID A-MPDU. |
| Multi-TID Aggregation Tx Support | Indicates the number of TIDs of QoS Data frames that an HE STA can transmit in a multi-TID A-MPDU as described in 26.6.3 (Multi-TID A-MPDU and ack-enabled single-TID A-MPDU). | Set to the number of TIDs minus 1 of QoS Data frames that an HE STA can transmit in a multi-TID A-MPDU. |
| HE Link Adaptation Support | Indicates support for link adaptation using the HLA Control subfield. | If +HTC-HE Support is 1:Set to 0 (No Feedback) if the STA does not provide HE MFB.Set to 2 (Unsolicited) if the STA can receive and provide only unsolicited HE MFB.Set to 3 (Solicited and unsolicited) if the STA is capable of receiving and providing HE MFB in response to HE MRQ and if the STA can receive and provide unsolicited HE MFB.The value 1 is reserved.HE MFB and HE MRQ are MFB and MRQ using HLA Control subfield, respectively.Reserved if +HTC-HE Support is 0. |
| All Ack Support | Indicates support for the reception of a Multi-STA BlockAck frame under the all ack context (see 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame)) | Set to 1 if supported.Set to 0 otherwise. |
| TRS Support | For a non-AP STA, indicates support for receiving a frame with a TRS Control subfield. | For a non-AP STA that has set the +HTC-HE Support field to 1:Set to 1 if the STA supports reception of the TRS Control subfield.Set to 0 otherwise.Reserved for an AP or if the +HTC-HE Support field is 0. |
| BSR Support | For an AP, indicates support for receiving a frame with a BSR Control subfield. For a non-AP STA, indicates support for generating a frame with a BSR Control subfield. | If +HTC-HE Support is 1:Set to 1 if the STA supports the BSR Control subfield functionality.Set to 0 otherwise.Reserved if +HTC-HE Support is 0. |
| Broadcast TWT Support | For a non-AP STA, indicates support for the role of TWT scheduled STA. For an AP indicates support for the role of TWT scheduling AP as described in 26.8.3 (Broadcast TWT operation). | Set to 1 if the STA supports broadcast TWT functionality.Set to 0 otherwise. |
| 32-bit BA Bitmap Support | Indicates support for the reception of a Multi-STA BlockAck frame that has a Per AID Info subfield addressed to it with a 32-bit Block Ack Bitmap subfield. | Set to 1 if the STA supports reception of a Multi-STA BlockAck frame that has a Per AID Info subfield addressed to it with a 32-bit Block Ack Bitmap subfield.Set to 0 otherwise. |
| MU Cascading Support | Indicates support for participating in an MU cascading sequence (see 26.5.3 (MU cascading sequence)). | For an HE AP:Set to 1 to indicate that the AP is capable of transmitting an A-MPDU that is constructed following the MU cascade sequence rules (see 26.5.3 (MU cascading sequence)) under MU cascade operation.Set to 0 otherwise.For a non-AP HE STA:Set to 1 to indicate that the non-AP STA is capable of receiving an A-MPDU that is constructed following the MU cascade sequence rules (see 26.5.3 (MU cascading sequence)).Set to 0 otherwise. |
| Ack-Enabled Aggregation Support | Indicates support by a STA to receive an A-MPDU that contains two or more frames at least one of which solicits an Ack frame or acknowledgment context in a Multi-STA BlockAck frame as described in 26.6.3 (Multi-TID A-MPDU and ack-enabled single-TID A-MPDU) and 26.5.1.1 (General). | Set to 1 if the STA supports reception of this A-MPDU format.Set to 0 otherwise. |
| HE Dynamic SM Power Save Timeout Support(#24054) | Indicates support for an HE dynamic SM power save timeout. See 26.14.4 (HE dynamic SM power save). | For a non-AP STA, if the HE Dynamic SM Power Save subfield is set to 1:Set to 1 if supported.Set to 0 otherwise.Reserved for an AP or if the HE Dynamic SM Power Save subfield is set to 0  |
| OM Control Support | Indicates support for receiving a frame with an OM Control subfield. | If the +HTC-HE Support subfield is 1 in a non-AP STA:Set to 1 if the non-AP STA supports reception of the OM Control subfield.Set to 0 otherwise.Reserved if the +HTC-HE Support subfield is 0 in a non-AP STA.An AP sets the OM Control Support subfield to 1. |
| OFDMA RA Support | For a non-AP STA, indicates support for the OFDMA random access procedure. For an AP, indicates support for sending Trigger frames that allocate RA-RUs. See 26.5.4 (UL OFDMA-based random access (UORA)). | Set to 1 if supported.Set to 0 otherwise. |
| Maximum A-MPDU Length Exponent Extension | Indicates the exponent extension for the maximum A-MPDU length supported in reception (see 26.6 (A-MPDU operation in an HE PPDU)). | Set to the value of the maximum A-MPDU exponent extension value. |
| A-MSDU Fragmentation Support | Indicates support for the reception of fragmented A-MSDUs. | If the Dynamic Fragmentation Support subfield is not 0:Set to 1 to indicate support for the receipt of fragmented A-MSDUs.Set to 0 to indicate that reception of fragmented A-MSDUs is not supported.Reserved if the Dynamic Fragmentation Support subfield is 0. |
| Flexible TWT Schedule Support | Indicates support for the reception of TWT Information frames with flexible TWT schedules as defined in 26.8.4.4 (TWT Information frame exchange for flexible wake time). | Set to 1 if the STA supports reception of a TWT Information frame with flexible TWT schedules.Set to 0 otherwise. |
| Rx Control Frame To MultiBSS | For a non-AP STA associated with a BSS corresponding to a nontransmitted BSSID, indicates support for the reception of a Control frame with TA equal to the transmitted BSSID. | For a non-AP STA:Set to 1 if supported.Set to 0 otherwise.Reserved for an AP. |
| BSRP BQRP A-MPDU Aggregation | For a non-AP STA, indicates whether or not the STA accepts a BSRP Trigger frame or BQRP Trigger frame that is aggregated with other Control, Data and Management frames in an A-MPDU destined to the STA. | For a non-AP STA:Set to 1 if supported.Set to 0 otherwise.Reserved for an AP. |
| QTP Support | Indicates support for quiet time period (QTP) operation as described in 26.17.5 (Quiet HE STAs in an HE BSS). | Set to 1 if supported.Set to 0 otherwise. |
| BQR Support | For an AP, indicates support for receiving a frame with a BQR Control subfield. For a non-AP STA, indicates support for generating a frame with a BQR Control subfield. | If +HTC-HE Support is 1:Set to 1 if the STA supports the BQR Control subfield functionality.Set to 0 otherwise.Reserved if +HTC-HE Support is 0. |
| PSR Responder | Indicates support for the role of PSR responder. | Set to 1 if the STA supports the role of PSR responder.Set to 0 otherwise. |
| NDP Feedback Report Support | For an AP, indicates support for the NDP feedback report procedure.For a non-AP STA, indicates support for responding to an NFRP Trigger frame. | Set to 1 if supported.Set to 0 otherwise. |
| OPS Support | For an AP, indicates support for encoding OPS information in the TIM element of FILS Discovery frames, TIM frames or OPS frames as described in 26.14.3.2 (AP operation for opportunistic power save). For a non-AP STA, indicates support for receiving the opportunistic power save encoded TIM elements. | Set to 1 if supported.Set to 0 otherwise. |
| A-MSDU Not Under BA In Ack-Enabled A-MPDU Support | Indicates support by a STA to receive an ack-enabled single-TID A-MPDU that carries an A-MSDU that is not under a block ack agreement. | Set to 1 if supported.Set to 0 otherwise. |
| HE Subchannel Selective Transmission Support | Indicates whether an HE STA supports an HE subchannel selective transmission operation described in 26.8.7 (HE subchannel selective transmission). | Set to 1 if supported.Set to 0 otherwise. |
| UL 2×996-tone RU Support | Indicates support by a non-AP STA to receive a TRS Control subfield or a Trigger frame with a User Info field addressed to the STA with the RU Allocation subfield of the TRS Control subfield or the User Info field indicating 2×996-tone RU. | For a non-AP STA:Set to 1 if the STA supports reception of a TRS Control subfield with the RU Allocation subfield indicating a 2×996-tone RU or a Trigger frame with a User Info field addressed to the STA with the RU Allocation subfield indicating 2×996-tone RU.Set to 0, otherwise.Reserved for an AP. |
| OM Control UL MU Data Disable RX Support | Indicates whether an AP supports interpretation of the UL MU Data Disable subfield of the OM Control subfield as described in 26.5.2 (UL MU operation). | For an AP:Set to 1 if supported.Set to 0 otherwise.Reserved for a non-AP STA. |
| HE Dynamic SM Power Save | Indicates support for HE dynamic SM power save.(#24054) See 26.14.4 (HE dynamic SM power save). | For a non-AP STA:Set to 1 if supported. Set to 0 otherwise.(#24054)Reserved for an AP. |
| Punctured Sounding Support | Indicates support for punctured sounding as described in 26.7 (HE sounding protocol). | Set to 1 if dot11HEPuncturedSoundingOptionImplemented is true (see 26.7 (HE sounding protocol)).Set to 0 otherwise. |
| HT And VHT Trigger Frame Rx Support | Indicates support for receiving a Trigger frame in an HT PPDU and receiving a Trigger frame in a VHT PPDU. | For a non-AP STA: Set to 1 if supported.Set to 0 otherwise.Reserved for an AP. |

***TGax Editor: Modify subclause 9.6.32.1 Protected HE Action field as shown:***

**9.6.32 Protected HE Action frame details**

**9.6.32.1 Protected HE Action field**

A Protected HE Action field, in the octet immediately after the Category field, differentiates the Protected HE Action frame formats. The Protected HE Action field values associated with each frame format within the HE category are defined in Table 9-524a (HE Action field values).

Table 9-524e-Protected HE Action field values

|  |  |
| --- | --- |
| Value | Meaning |
| 0 | HE BSS Color Change Announcement |
| 1 | MU EDCA Control |
| 2 | SMPS Operation(#24054) |
| ~~1~~3-255 | Reserved |

***TGax Editor: Insert the following new subclause in an appropriate location:***

**9.6.32.4 SMPS Operation frame format(#24054)**

The SMPS Operation frame is an Action or Action No Ack frame of category Protected HE. The Action field of an SMPS Operation frame contains the information shown in Table 9-xxx (SMPS Operation frame Action field format).

Table 9-xxx- SMPS Operation frame Action field format

|  |  |
| --- | --- |
| Order | Information |
| 1 | Category |
| 2 | Protected HE Action |
| 3 | SMPS Control |

The Category field is defined in Table 9-53 (Category values).

The Protected HE Action field is defined in Table 9-526e (Protected HE Action field values).

The SMPS Control field is defined in Figure 9-xx.

|  |  |  |
| --- | --- | --- |
|  | B0 B3 | B4 B7 |
|  | SMPS Timeout | Reserved |
| Bits: | 4 | 4 |

**Figure 9-xx—SMPS Control field format**

The SMPS Timeout subfield contains the timeout value in milliseconds for HE dynamic SM power save operation, as described in 26.14.4 (HE dynamic SM power save). The value 0 is reserved.

***TGax Editor: Modify subclause 26.14.4 HE dynamicSM power save as shown:***

**26.14.4 HE dynamic SM power save**

A STA that supports HE dynamic SM power save has dot11HEDynamicSMPowerSaveOptionImplemented set to true and shall set the HE Dynamic SM Power Save subfield in the HE MAC Capabilities Information field of the HE Capabilities element it transmits in the 2.4 GHz or 5 GHz band to 1 and shall set the SM Power Save subfield in the HE 6 GHz Band Capabilities element it transmits in the 6 GHz band to 1.(#24054)

A non-AP HE STA in dynamic SM power save mode (see 11.2.6 (SM power save)) that sets the HE Dynamic SM Power Save subfield in the HE MAC Capabilities Information field of the HE Capabilities element it transmits to 1 or that sets the SM Power Save subfield in the HE 6 GHz Band Capabilities element it transmits to 1 shall follow the dynamic SM power save procedures defined in 11.2.6 (SM power save) and shall also enable its multiple receive chains if it responds to a Trigger frame addressed to it as described below.(#24054)The non-AP HE STA enables its multiple receive chains if it responds to a Trigger frame that starts a frame exchange sequence. Such a frame exchange sequence shall satisfy the following conditions: (#24054)

— The starting Trigger frame is transmitted with a single spatial stream. (#24054)

— The starting Trigger frame is from the associated AP or from the AP corresponding to the transmitted BSSID if the non-AP HE STA is associated with a nontransmitted BSSID and has indicated support for receiving Control frames with TA set to the transmitted BSSID by setting the Rx Control Frame To MultiBSS subfield to 1 in the HE Capabilities element that the non-AP HE STA transmits.

— The starting Trigger frame is broadcast. (#24054)

— The starting Trigger frame is an MU-RTS Trigger frame, BSRP Trigger frame or BQRP Trigger frame that includes a User Info field with the AID12 subfield equal to the 12 LSBs of the AID of the non-AP HE STA (see 26.5.2.2.1 (General)) in dynamic SM power save mode.

The non-AP HE STA shall, subject to its spatial stream capabilities (see 9.4.2.55.4 (Supported MCS Set field), 9.4.2.157.3 (Supported VHT-MCS and NSS Set field) and 9.4.2.247 (HE Capabilities element)) and operating mode (see 11.41 (Notification of operating mode changes) and 26.9 (Operating mode indication)), be capable of receiving a PPDU that is sent using more than one spatial stream a SIFS after the end of the PPDU that it sends in response. (#24054)

If the non-AP HE STA has set the HE Dynamic SM Power Save Timeout Support subfield in the HE MAC Capabilities Information field to 1 and has received from the AP an SMPS Operation frame that is broadcast or addressed to it, it shall start a timer after the end of the PPDU that it sends in response to the Trigger frame and may switch back to the single receive chain mode when this timer reaches the time indicated by the SMPS Timeout subfield in the SMPS Operation frame; it shall restart the timer if it responds to another Trigger frame that meets the conditions above before this timer has expired. (#24054)

Otherwise, the non-AP HE STA may switch back to the single receive chain mode immediately after the frame exchange sequence ends. (#24054)

 (…existing texts…)

**End of proposed changes.**