### IEEE P802.11 Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 11ax D2.0 MAC Comment Resolution for CID 18555 | | | | |
| Date: 2018-01-14 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Guoqing Li | Apple Inc. | 1 Infinity Loop, Cupertino, CA 95014 |  | Guoqing\_li@apple.com |
| Pooya Monajemi | Cisco |  |  |  |
|  |  |  |  |  |

Abstract

This submission proposes resolution for CID 18555 of TGax Draft 2.0

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 TGax D2.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax D2.0 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** | **Commenter** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 11855 | Guoqing Li | 194.21 | 10.22.1 | As 11ax is transitioning into a scheduling-based system, there is a need for AP to collect more info on STA's traffic and QoS requirement for efficient scheduling, which is what TSEPC is for. Currently, TSPEC is closely tied to HCCA which is deprecated for HE STAs. Modify the text on TSPEC to make sure that HE STA can use it efficiently and correctly or define mechanisms that allows the STA to feedback its scheduling requirements. | Modify the text on TSPEC to make sure that HE STA can use it efficiently and correctly. | Revised –  The description does not imply any specific sounding procedure. It simply says that a STA always uses multiple protection in a TXOP that includes HE NDP Announcement or HE BRP Trigger frame. Also note that HE NDPA and VHT NDPA are the same frame type. We revise the description by combining it with the bullet of VHT description.  TGax editor to make the changes shown in 11-17/xxxxr0 under all headings that include CID 12357. |

Discussion:

As 11ax systems is enabling scheduling/MU operation, the need for AP to obtain accurate and timely information regarding STAs’ persistent traffic characteristics and QoS requirements is critical for APs to satisfy STAs’ QoS requirements.

TSPEC is a good candidate that can be used for such purpose. However, in baseline spec, TSPEC is closely related to TS operation for HCCA and admission control. To simplify the operation for HE STAs, we propose to use TSPEC as a means to deliver traffic information instead of requiring APs to perform traffic stream operation and admission control, packet mapping and classification, traffic stream setup/activation/suspension, TS life cycle management etc.

In order to do so, one important step is to modify the association between TSPEC and TS. Specifically, instead of using TSID to identify TS use TSID in TSPEC as a scheduling request ID and clarify that HE STAs do not follow 11.4 (TS Operation). This will significantly simply the complexity to use TSPEC for HE STAs.

In addition to TSPEC, persistent scheduling request using A-Control is also proposed, which can be sent in data frames to allow fast notification of any changes in QoS or traffic characteristics. Such signaling can be very useful when the real time application use fast rate adaptation.

The Proposed text changes are as follows.

***TGax editor: Change 9.4.2.10 as follows: (Track change on)***

**9.4.2.30 TSPEC element**

***TGax editor: Modify fhe first paragraph as follows:***

The TSPEC element contains the set of parameters that define the characteristics and QoS expectations of a traffic flow, in the context of a particular STA, for use by the HC or PCP and STA(s) or a mesh STA and its peer mesh STAs in support of QoS traffic transfer using the procedures defined in 11.4 (TS operation) and 11.24.16.3 (GCR procedures), or for use by HE STAs in support of HE APs’ scheduling for MU operations (27.5 MU Operations). The element information format comprises the items as defined in this subclause, and the structure is defined in Figure 9-295 (TSPEC element format).

***TGax editor: Modify the 4th paragraph as follows:***

The subfields of the TS Info field are defined as follows:

--The Traffic Type subfield is a single bit and is set to 1 for a periodic traffic pattern (e.g., isochronous TS of MSDUs or A‑MSDUs, with constant or variable sizes, that are originated at fixed rate) or set to 0 for an -aperiodic, or unspecified, traffic pattern (e.g., asynchronous TS of low-duty cycles).

--The TSID subfield is 4 bits in length and contains a value that is a TSID. Note that the MSB (bit 4 in TS Info field) of the TSID subfield is always set to 1 when the TSPEC element is included within an ADDTS Response frame. For HE STAs, TSID subfield contains the TID associated with this TSPEC.

-- Direction subfield specifies the direction of data carried by the TS as defined in Table 9-152 (Direction subfield encoding).

|  |  |  |
| --- | --- | --- |
| **Direction subfield encoding** |  |  |
| **Bit 5** | **Bit 6** | **Usage** |
| 0 | 0 | Uplink, defined as follows:  Non-DMG BSS: MSDUs or A‑MSDUs are sent from the non-AP non-HE STA to HC or from the HE STA to the HE AP  DMG BSS: MSDUs or A‑MSDUs are sent by the non-AP originator of the ADDTS Request frame |
| 1 | 0 | Downlink, defined as follows:  Non-DMG BSS: MSDUs or A‑MSDUs are sent from the HC to the non-AP non-HE STA or from the HE AP to the HE STA  DMG BSS: MSDUs or A‑MSDUs are sent by the non-AP recipient of the ADDTS Request frame |
| 0 | 1 | Direct link (MSDUs or A‑MSDUs are sent from the non-AP STA to another non-AP STA) |
| 1 | 1 | Bidirectional link (equivalent to a downlink request plus an uplink request, each -direction having the same parameters).  The fields in the TSPEC element specify resources for a single direction. Double the specified resources are required to support both streams. |

--The Access Policy subfield is 2 bits in length, specifies the access method to be used for the TS, and is defined in Table 9-153 (Access Policy subfield).

|  |  |  |
| --- | --- | --- |
| **Access Policy subfield** |  |  |
| **Bit 7** | **Bit 8** | **Usage** |
| 0 | 0 | Reserved |
| 1 | 0 | For non-HE STAs: Contention based channel access (EDCA)  For HE STAs: Contention based channel access (EDCA) or MU based access (27.5 MU Operation) |
| 0 | 1 | Controlled channel access (HCCA for non-DMG STAs and SPCA for DMG STAs) |
| 1 | 1 | Controlled and contention based channel access (HCCA, EDCA mixed mode (HEMM) for non-DMG STAs; SPCA, EDCA mixed mode (SEMM) for DMG STAs) |

--The Aggregation subfield is 1 bit in length. The Aggregation subfield is valid only when the access method is HCCA or SPCA or when the access method is EDCA and the Schedule subfield is equal to 1. It is set to 1 by a non-AP STA to indicate that an aggregate schedule is required. It is set to 1 by the AP if an aggregate schedule is being provided to the STA. It is set to 0 otherwise. In all other cases, the Aggregation subfield is reserved.

--The APSD subfield is a single bit and is set to 1 to indicate that automatic PS delivery is to be used for the traffic associated with the TSPEC and set to 0 otherwise.

--The UP subfield is 3 bits and indicates the actual value of the UP to be used for the transport of MSDUs or A‑MSDUs belonging to this TS when relative prioritization is required. When the TCLAS element is present in the request, the UP subfield in TS Info field of the TSPEC element is reserved.



--The Schedule subfield is 1 bit in length and specifies the requested type of schedule. For non-HE STAs, the setting of the subfield when the access policy is EDCA is shown in Table 9-155 (Setting of Schedule subfield). When the Access Policy subfield is equal to any value other than EDCA, the Schedule subfield is reserved. When the Schedule and APSD subfields are equal to 1, the AP sets the aggregation bit to 1, indicating that an aggregate schedule is being provided to the STA. For HE STAs, the Schedule subfield is reserved.

|  |  |  |
| --- | --- | --- |
| **Setting of Schedule subfield** |  |  |
| **APSD** | **Schedule** | **Usage** |
| 0 | 0 | No Schedule |
| 1 | 0 | Unscheduled APSD |
| 0 | 1 | Scheduled PSMP or GCR-SP |
| 1 | 1 | Scheduled APSD |

***TGax editor: modify the 10 and 11th paragraph as follows:***

The Inactivity Interval field is 4 octets long and contains an unsigned integer that specifies the minimum amount of time, in microseconds, that can elapse without arrival or transfer of an MPDU belonging to the TS before this TS is deleted by the MAC entity at the HC for a non-HE STA, or before the information provided in this TSPEC is considered invalid at HE STAs for HE STAs.

For non-HE STAs, the suspension Interval field is 4 octets long and contains an unsigned integer that specifies the minimum amount of time, in microseconds, that can elapse without arrival or transfer of an MSDU belonging to the TS before the generation of successive QoS(+)CF-Poll is stopped for this TS. A value of 4 294 967 295 (= 232 – 1) disables the suspension interval, indicating that polling for the TS is not to be interrupted based on inactivity. The value of the suspension interval is always less than or equal to the inactivity interval. The Suspension Interval field is reserved for HE STAs.

***TGax editor: modify Table 9-18a as follows:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Control ID subfield values** |  |  |  |
| **Control ID value** | **Meaning** | **Length of the Control Information subfield (bits)** | **Content of the Control Information subfield** |
| 0 | UL MU response scheduling (UMRS)(#4727) | 26 | See 9.2.4.6.4.2 (UMRS Control) |
| 1 | Operating mode (OM)(#4727) | 12 | See 9.2.4.6.4.3 (OM Control) |
| 2 | HE link adaptation (HLA)(#4727) | 26(#4786) | See 9.2.4.6.4.4 (HLA Control) |
| 3 | Buffer status report (BSR) | 26 | See 9.2.4.6.4.5 (BSR Control) |
| 4 | UL power headroom (UPH)(#4727) | 8 | See 9.2.4.6.4.6 (UPH Control) |
| 5 | Bandwidth query report (BQR) | 10 | See 9.2.4.6.4.7 (BQR Control) |
| 6 | Command Control Indication(#8087) | 8 | See 9.2.4.6.4.8 (CAS Control))(#5025, #7471) |
| 7 | Persistent Scheduling Request | 26 | See 9.2.4.6.4.9 (PSR Control) |
| 8-15 | Reserved |  |  |

***TGax editor: Add a subclause 9.2.4.6.4.9 as follows:***

9.2.4.6.4.9 PSR Control

If the Control ID subfield is 7, the Control Information subfield contains Persistent Scheduling Request (PSR) information that is used to convey traffic characteristics from an HE non-AP STA to an HE AP. The format of the subfield is shown in Figure 9-x (Control Information subfield format when Control ID is 7).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0            B2 | B3              B4 | B5          B14 | B15                   B24 | B25 |
|  | TSID | PSR Control | Nominal Traffic Rate | Nominal Burst Interval | Direction |
| Bits: | 3 | 2 | 10 | 10 | 1 |

**Figure 9-x Control Information subfield format when Control ID subfield is 7**

The TSID is subfield defined in 9.4.2.30.

The PSR (Persistent Schedule Request) Control subfield is defined in Table 9-x.

|  |  |
| --- | --- |
| **PSR Control value** | **Meaning** |
| 00 | Initial scheduling request |
| 01 | Modify an existing scheduling request |
| 10 | Delete an existing scheduling request |
| 11 | reserved |

Table 9-x PSR Control subfield

The Nominal Traffic Rate subfield indicates the expected traffic generation rate, measured at the MAC\_SAP, associated with this TSID, in units of 1Mbps.

The Nominal Burst Interval subfield contains the value of the expected traffic generation interval, measured at the MAC\_SAP, associated with this TSID, in units of 1ms.

The Direction subfield indicates whether this Scheduling request is for uplink or for both uplink and downlink with the same nominal traffic rate and nominal burst interval in each direction. Value 0 indicates uplink and value 1 indicates both uplink and downlink.

TGax Editor: Modify 9.4.2.237.2 as follow:

Add a bit to Figure 9-589ck HE MAC Capabilities Information field as follows called “PSR Control Support”.

Add a row to Table 9-262z Subfields of the HE MAC Capabilities Information field as follow

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| PSR Control Support | Indicates support for the reception of a PSR Control fioeld | Set to 1 if supported.  Set to 0 otherwise. |

***TGax editor: add a new subclause in 27 as follow:***

**27.x Use of TSPEC and Persistent Scheduling Request by HE STAs**

HE non-AP STAs may use a TSPEC contained in a Basic ADDTS Request frame to provide their traffic characteristics and QoS requirements to HE-APs in order to facilitate efficient scheduling in the HE APs’ MU Operations. A TSPEC provided by an HE non-AP STA is used by a receiving HE AP to facilitate the creation of a schedule for MU Operations (27.5). A TSPEC provided by an HE non-AP STA to an HE AP is uniquely identified by the TSID subfield and the MAC address of the HE non-AP STA. The method that an HE non-AP STA uses to collect traffic information and construct TSPECs is beyond the scope of this specification. An HE AP does not transmit an ADDTS Response frame as a response to the ADDTS Request frame sent by an HE non-AP STA. The acknowledgement of the ADDTS Request frame confirms the receipt of the TSPEC at the HE AP. An HE non-AP STA should send a DELTS frame with the corresponding TSID when the traffic associated with the TSID has been terminated. When receiving a DELTS from an HE non-AP STA, the HE AP shall consider the information provided in the TSPEC as no longer valid.

An HE non-AP STA may send Persistent Scheduling Request Control (PSR Control) information in an Aggregated Control subfield by setting the value to 7 within the Control ID subfield (9.2.4.6.4.9 PSR Control) in frames transmitted to the STA’s associated HE AP if the HE AP has indicated support of PSR Control in HE Capabilities element. The STA may indicate a status of Initial, modified or deletion for the information within the PSR Control field. An HE AP may use the information contained in received PSR Control subfields to facilitate its scheduling for MU Operations (27.5 MU Operations). An HE non-AP STA should send a PSR Control subfield with the SR control field indicating deletion of a Scheduling Request when the traffic associated with this Scheduling Request has terminated.