IEEE P802.11
Wireless LANs

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| Proposed Resolutions to CIDs 4145, 4146, and 4147 |
| Date: 2020-05-25 |
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Abstract

This submission contains proposed resolutions to CIDs 4145, 4146, and 4147.

R0: Initial draft

R1: Changes based on the discussion during the June 5 teleconference.

R2: Changes based on e.mail discussion

R3: changes based on discussion during the teleconference 2020-07-22. Added CID 4144 and CID 4715.

R4: Change the NOTE underneath the TID definition to replace traffic categories with user priorties.

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| **CID** | **Page** | **Line** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 4144 | 170 | 48 | 3.1 | The IEEE 802.11e amendment added Traffic Category (TC), User Priority (UP), Traffic Stream (TS) and TSID. Among these four new additions Traffic Category seems to be redundant and can easily map to UP. TC seems to be an intermediate parameter that serves no purpose. It is also true that the term traffic category is not available in 802.1D which is the reference for the UP bits. In fact 802.1D makes use of the term "Traffic Classes" which is easier to understand that the vague Traffic Category term. | Delete Traffic Category from the draft and replace it with UP everywhere. | RevisedTGm Editor: Please make the following changes (#4144, #4145, #4147) |
| 4145 | 797.00 | 59 | 9.2.4.5.2 | In many places in the draft it is mentioned; "The TID subfield identifies the TC or TS to which the corresponding MSDU (or fragment thereof) orA-MSDU in the Frame Body field belongs". It is probably more straightforward to mention that "TID subfield indicates the UP or the TSID..." as per table 9-12. | As in comment | RevisedTGm Editor: Please make the following changes (# 4144, #4145, #4147) |
| 4147 | 917.00 | 5 | 9.4.1.13 | "TID subfield contains the TC or TS for which the BlockAck frame is being requested". In fact the TID doesn't contain the TC or the TS. It contain the UP or the TSID. The same sentence is repeated in other places of the draft. | Change "TID subfield contains the TC or TS for which the BlockAck frame is being requested." to "TID subfield contains the UP or TSID for which the BlockAck frame is being requested.". | RevisedTGm Editor: Please make the following changes (#4144, #4145, #4147) |

**Discussion:**

802.11 HCF supports two access methods:

HCF Controlled Channel Access (HCCA): A paramterized channels access managed by the Traffic Stream (TS) and TSID requesting resources using TSPEC IE. Therefore both TS and TSID are needed.

HCF contention based channel access (EDCA): A prioritized channel access completely managed by the user priority (UP) as evident by Table 10-1 (UP to AC mappings). Unfortunately an intermediate and unnecessary parameter was introduced namely the so called “traffic category (TC)” defined as:

**traffic category (TC):** A label for medium access control (MAC) service data units (MSDUs) that have a

distinct user priority (UP), as viewed by higher layer entities, relative to other MSDUs provided for delivery

over the same link. Traffic categories are meaningful only to MAC entities that support quality of service

(QoS) within the MAC data service. These MAC entities determine the UP for MSDUs belonging to a

particular traffic category using the priority value provided with those MSDUs at the MAC service access

point (MAC SAP).

Table 10.1 UP to AC mapping depend only on the UP and there is no mentioning of TC.

The concept of user priority is borrowed from 802.1Q and 802.1D. Both documents when reviewed refer to UP directly without any mentioning of TC as described in the definition given above.

Additionally documents from other organizations considereding Wi-Fi QoS have eliminated the TC and focuses on the UP only (WMM Specification 1.2) in the QoS Control field.

**Proposed Resolution: Revise**

TGm Editor: Please make the following changes (#4144, #4145, #4147)

P171L10

**traffic identifier (TID):** Any of the identifiers usable by higher layer entities to distinguish medium access control (MAC) service data units (MSDUs) to MAC entities that support quality of service (QoS) within the MAC data service.

NOTE—There are 16 possible TID values; eight identify user priorities, and the other eight identify parameterized traffic streams (TSs). The TID is assigned to an MSDU in the layers above the MAC.

P170L48

P218L10

P275L13

IEEE Std 802.11 uses a shared medium and provides differentiated control of access to the medium to handle data transfers with QoS requirements. The QoS facility (per MSDU user priority and TSPECnegotiation) allows an IEEE 802.11 LAN to become part of a larger network providing end-to-end QoS delivery or to function as an independent network providing transport on a per-link basis with specified QoS commitments. The specifications regarding the integration and operability of the QoS facility with any other end-to-end QoS delivery mechanism like Resource Reservation Protocol (RSVP) are beyond the scope of this standard.

P299L24

All STAs support the data service, but only QoS STAs in a QoS BSS differentiate their MSDU delivery according to the designated user priority or traffic stream (TS) of individual MSDUs. QoS STAs that support the QMF service differentiate their MMPDU delivery according to the MMPDU’s access category. The access category of each MMPDU is designated by the transmitter’s current QMF policy.

P299L51

The QoS facility supports eight priority values, referred to as *UPs*. The values a UP may take are the integer values from 0 to 7 and are identical to the IEEE 802.1D™ priority tags. The UP is provided with each MSDU at the medium access control service access point (MAC SAP) either directly, in the UP parameter, or indirectly, in a TSPEC or SCS Descriptor element designated by the UP parameter.

P796L43

The QoS Control field is a 16-bit field that identifies the UP or TS to which the frame belongs as well as various other QoS-related, A-MSDU related, and mesh-related information about the frame that varies by frame type, subtype, and type of transmitting STA. The QoS Control field is present in all Data frames in which the QoS subfield of the Subtype subfield is equal to 1 (see 9.2.4.1.3 (Type and Subtype subfields)).

P797L60

The TID subfield identifies the UP or TS to which the corresponding MSDU (or fragment thereof) or A-MSDU in the Frame Body field belongs. The TID subfield also identifies the TC or TS of traffic for which a TXOP is being requested, through the setting of TXOP duration requested or queue size. The encoding of the TID subfield depends on the access policy (see 9.4.2.29 (TSPEC element)) and is shown in

P798L39

In QoS Data +CF-Poll frames, the TID subfield in the QoS Control field indicates the TID of the data. In

QoS (+)CF-Poll frames of subtype Null, the TID subfield in the QoS Control field indicates the TID for

which the poll is intended. The requirement to respond to that TID is nonbinding, and a STA can respond

with any frame (see 10.23.3.5.1 (General)). For STAs where dot11OCBActivated is true, traffic streams are not used and the TID always corresponds to a UP.

P801L7

The Queue Size subfield is an 8-bit field that indicates the amount of buffered traffic for a given UP or TS at the STA sending this frame.

P918L5

The TID subfield contains the UP or TS for which the BlockAck frame is being requested.

P1033L59

The TID subfield indicates the UP or TS for which traffic is to be measured

P1035L15

- The Average bit(M101) is set to 1 to request that a Transmit Stream/Category Measurement report be generated when the number of MSDUs for the UP or TS given by the TID that are discarded out of the number of preceding MSDUs specified in Measurement Count is greater than or equal to the value given in Average Error Threshold. MSDUs discarded due to the number of transmit attempts exceeding dot11ShortRetryLimit or dot11LongRetryLimit, or due to the MSDU lifetime having been reached, are counted.

— The Consecutive bit(M101) is set to 1 to request that a Transmit Stream/Category Measurement report be generated when the number of MSDUs for the UP or TS given by the TID that are discarded in succession is greater than or equal to the value given in Consecutive Error Threshold.

MSDUs discarded due to the number of transmit attempts exceeding dot11ShortRetryLimit or

dot11LongRetryLimit, or due to the MSDU lifetime having been reached, are counted.

— The Delay bit(M101) is set to 1 to request that a Transmit Stream/Category Measurement report be generated when the number of consecutive MSDUs for the UP or TS given by the TID that experience a transmit delay greater than or equal to the value specified in the Delay Threshold subfield is greater than or equal to the value given in Delayed MSDU Count. Delay is measured from the time the MSDU is passed to the MAC until the point at which the entire MSDU has been successfully transmitted, including receipt of the final Ack frame from the peer STA if the QoSAck service class is being used.

P1076L50

The Traffic Identifier field contains the TID subfield as shown in Figure 9-204 (Measurement Request field format for Transmit Stream/Category Measurement Request). The TID subfield indicates the UP or TS for which traffic was measured.

P1077L35

The Transmitted MSDU Count field contains the number of MSDUs for the UP or the TS specified by the TID that were successfully transmitted.

The MSDU Discarded Count field contains the number of MSDUs for the UP or the TS specified by the TID that were discarded due either to the number of transmit attempts exceeding dot11ShortRetryLimit ordot11LongRetryLimit (as appropriate), or due to the MSDU lifetime having been reached.

The MSDU Failed Count field contains the number of MSDUs for the UP or the TS specified by the TID that were discarded due to the number of transmit attempts exceeding dot11ShortRetryLimit or

dot11LongRetryLimit (as appropriate).

The MSDU Multiple Retry Count field contains the number of MSDUs for the UP or the TS specified by the TID that were successfully transmitted after more than one retransmission attempt.

P1502L49

The TID subfield identifies the UP or TS for the allocation request or grant.

P1520L6

ADDBA Request and ADDBA Response frames are used to set up or, if a STA is PBAC, to modify Block

Ack operation for a specific UP, TS, or GCR group address.

P1722L9

The HC traffic delivery and TXOP allocation may be scheduled (#65)to meet the QoS requirements of a particular UP or TS. TXOP allocations and contention free transfers of QoS traffic might be based on the HC’s BSS-wide knowledge of the amounts of pending traffic belonging to different TS and/or TCs and are subject to BSS-specific QoS policies.

P1842L59

(#2664)(#1505)A QoS STA shall maintain a frame retry count(#2431) for each MSDU, A-MSDU, or

MMPDU that belongs to a UP that requires acknowledgment. The initial value for the frame retry

count(#2431) shall be 0.

P1847L21

(#1505)When there is a transmission failure within a polled TXOP, the short retry count(#2431) (as described in 10.23.2.12 (Retransmit procedures)) corresponding to the failed MSDU or MMPDU shall be incremented. An MPDU belonging to a UP is subject to the respective retry limit as well as the dot11EDCATableMSDULifetime and is discarded when either of them is exceeded. An MPDU belonging to a TS with a specified delay bound is subject to delay bound and is discarded if the MPDU could not be transmitted successfully since it has been delivered to the MAC. An MPDU belonging to a TS with an unspecified delay is subject to dot11MaxTransmitMSDULifetime and is discarded when it is exceeded.

P1850L15

Control fields of these frames shall indicate the UP or TS to which the MPDU belongs. Furthermore, either the Queue Size subfield shall indicate the amount of queued traffic present in the output queue that the STA uses for traffic belonging to this UP or TS, or the TXOP Duration Requested subfield shall indicate the duration that the STA requests for use in the next TXOP for traffic belonging to this UP or TS. The queue size value reflects the amount on the appropriate queue not including the present MPDU. The queue size value may remain constant in all QoS Data frames that carry fragments of the same MSDU even if the amount of queued traffic changes as successive fragments are transmitted. In order to inform the HC of queue status, a STA may use the QoS Null frame indicating the TID and the queue size or TXOP duration request (also see 10.23.3.5.2 (TXOP requests)).

P1851L12

STAs may send TXOP requests during polled TXOPs or EDCA TXOPs using the QoS Control field in a QoS

Data frame or a QoS Null frame directed to the HC, with the TXOP Duration Requested or Queue Size

subfield value and TID subfield value indicated to the HC. APs indicate whether they process TXOP request or queue size in the QoS Info field in the Beacon, Probe Response, and (Re)Association Response frames. An AP shall process requests in at least one format. The AP may reallocate TXOPs if the request belongs to TS or update the EDCA parameter set if the above request belongs to UP. A STA shall use only the request format that the AP indicates it can process.

P1979L26

An SP allocation that is not an obsolete allocation is assigned to the source DMG STA identified in the

Source AID subfield in an Allocation field within the Extended Schedule element.(M69) The source DMG

STA shall initiate the frame exchange sequence that takes place during the SP at the start of the SP, except when the source DMG STA intends to establish a DMG protected period in which case the rules described in 10.39.6.6 (DMG and CMMG(11aj) protected period) shall be followed before the source DMG STA initiates the frame exchange in the SP. The SP allocation identifies the UP or TS for which the allocation is made; however, the type of traffic transmitted is not restricted to the specified UP or TS (11.4.1 (Introduction)).

(11aj)An SP is assigned to the source CMMG STA identified in the Source AID subfield in an Allocation field that is not an obsolete allocation within the Extended Schedule element. The source CMMG STA shall initiate the frame exchange sequence that takes place during the SP at the start of the SP, except when the source CMMG STA intends to establish a CMMG protected period in which case the rules described in 10.39.6.6 (DMG and CMMG(11aj) protected period) shall be followed before the source CMMG STA initiates the frame exchange in the SP. The SP allocation identifies the UP or TS for which the allocation is made; however, the type of traffic transmitted is not restricted to the specified UP or TS (11.4.1 (Introduction)).

P2309L52

The transmit stream/category measurement shall be made on traffic that is transmitted from the measuring QoS STA to the peer QoS STA and TID indicated in the request. The Peer STA Address may be the MAC address of the QoS STA from which the Measurement Request was sent, the MAC address of another QoS STA within the BSS, or the broadcast address. (#59)A broadcast address shall be used only with a TID corresponding to a UP. In the case of a broadcast address, measurement shall be made on all traffic for the specified TC. Depending on policy, a QoS AP may disallow transmit stream/category measurement requests for traffic to other QoS STAs in the BSS. In this case the QoS AP shall respond with a matching (#1486)Radio Measurement Report frame with the Incapable subfield of the Measurement Report Mode field set to 1.

P2310L32

If dot11RMTriggeredTransmitStreamCategoryMeasurementActivated is true, a QoS STA shall accept atriggered Transmit Stream/Category Measurement and shall reject it otherwise. A QoS STA accepting a triggered QoS measurement shall measure the requested UP or TS. If a trigger condition occurs, the measuring QoS STA shall send a Transmit Stream/Category Measurement report to the requesting QoS STA. The measuring QoS STA shall not send further triggered QoS reports until the Trigger Timeout period specified in the request has expired or new trigger conditions have been requested. Measurement of transmit stream/category metrics shall continue during the reporting timeout period. Reporting shall resume following the Trigger Timeout period, or immediately following the acceptance of new trigger conditions.

If a QoS STA receives a Transmit Stream/Category Measurement request for a UP, or TS that is already being measured using a triggered transmit stream/category measurement, the triggered traffic stream measurement shall be suspended for the duration of the requested traffic stream measurement. When triggered measurement resumes, the traffic stream metrics shall be reset.

P2311L8

All triggered QoS measurements shall be terminated at a measuring QoS STA by receiving a triggered transmit stream/category measurement request with the Enable bit equal to 1 and the Report bit equal to 0. A triggered QoS measurement request with no trigger conditions specified in the Trigger Conditions field shall terminate a triggered QoS measurement for the UP or TS specified in the request. A QoS STA requesting a triggered QoS measurement may update the trigger conditions by sending a triggered transmit stream/category measurement request specifying the new trigger conditions.

There are 7 occurances of TC in Annex C. Change TC to UP in all of these occurances.

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| 4146 | 798.00 | 30 | 9.2.4.5.2 | Table 9-12 - the second row includes; "UP for either TC or TS, regardless of whether admissioncontrol is required". Now the issue is how TID can indicate the priority of a TS when TID is used for indicating UP or TSID? It seems not possible to indicate UP of a TS | Change; "UP for either TC or TS, regardless of whether admissioncontrol is required" to "UP regardless of whether admissioncontrol is required" | RevisedTGm Editor: Please make changes in <this document> related to CID 4146  |

Discussion:

The CID is referring to Table 9-12

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| * **TID subfield**
 |
| **Access policy** | **Usage** | **Allowed values(#2421)** |
| EDCA | UP for either TC or TS, regardless of whether admission control is required | 0–7 |
| HCCA, SPCA | TSID  | 8–15 |
| HEMM, SEMM | TSID, regardless of the access mechanism used | 8–15 |

The statement “UP for either TC or TS, regardless of whether admission control is required” doesn’t seem to be accurate. The TID indicates either the UP which is an attribute of the corresponding frame or the TSID but not both of them at the same time. It is true that the TSPEC e IE has some related info:



Where:

The TSID subfield (#2494) 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.

The UP subfield(#2494) 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

However this UP defined in TS Infor field is different for the UP defined in the frame MAC header and in this case the UP is a TS attribute and is likely to reside in the TS context in the device.

**Proposed Resolution: Revised**

TGm Edito: Please make the following changes to Table 9-12 (#4146)

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| * **TID subfield**
 |
| **Access policy** | **Usage** | **Allowed values(#2421)** |
| EDCA | UP  | 0–7 |
| HCCA, SPCA | TSID  | 8–15 |
| HEMM, SEMM | TSID, regardless of the access mechanism used | 8–15 |

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| **CID** | **Page** | **Clause** | **Comment** | **Proposed Resolution** | **Resolution** |
| 4751 |  |  | The distinctions made in the specification w.r.t. TS/TC/TSID/TID are incomprehensible | Make the definitions comprehensible. E.g. what does "UP for either TC or TS" mean? |  |

**Discussion**

Agree with the commenter.

IMHO one of the reson for confusion is the liberal use of the word “UP”. As far as I know there are three (#) places where UP appears in the MAC header or in IE.

1. UP appears in the QoS Info field of the MAC header when the value of the TID field is 0-7 and it represents user priority.
2. UP in the User Info field of the TSPEC element



The UP subfield(#2494) 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.

1. UP in the TCLAS element



The question is:

UP (TID) **≡** UP (TSPEC) **≡** UP (TCLAS)?

Even though the same name is used the use of the term “user priority” in the three places are not equivalent.

**UP (QoS Info)** is used to indicate the MSDU UP and map to appropriate to access category.

**UP (TSPEC)** seems to be a propert of a TS as identified by the TSID. From D3.0 P299L51:

The QoS facility supports eight priority values, referred to as *UPs*. The values a UP may take are the integer values from 0 to 7 and are identical to the IEEE 802.1D™ priority tags. An MSDU with a particular UP is said to belong to a traffic category (TC) with that UP. The UP is provided with each MSDU at the mediumaccess control service access point (MAC SAP) either **directl**y, in the UP parameter, or **indirectly**, in a TSPEC or SCS Descriptor element designated by the UP parameter. For the transmission of an MSDU that was provided to the Internal Sublayer Service SAP associated with a general link, the UP is determined by the GLK convergence function based on the priority parameter of the MA\_UNITDATA.request primitive(MDR2)(#2713). (See Annex R for recommended mapping guidelines.)(11ak)

The UP in this case defines the relative priority of MSDU belonging to a TS identified by TSID as indicated in the TID field of the QoS Info field. The UP is associated with the TSID and is stored in the TS context in a STA.

**UP (TCLAS)** is definitely not equivalent to any other use of the term “user priority” since the length of the field is different (1 Octet) and the use is different as defined by table 9-163 on page 1128 in D3.0.

Proposed Resolution:

Change the names of user prioirt in the User Info field of the TSPEC and the User Priority field in TCLAS.