IEEE P802.11
Wireless LANs

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| 802.11Proposed QoS response to WBA |
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**Abstract**

This submission proposes text related to QoS as a partial contribution to AANI’s response to WBA’s LS at: <https://mentor.ieee.org/802.11/dcn/21/11-21-0170-00-0000-2021-jan-liaison-from-wba-re-convergence.docx>

It covers the following topics:

* Packet classification for treatment of QoS flows in IPsec Child SAs
* Mapping of 5QIs to IEEE 802.11 QoS

**Packet classification for treatment of QoS flows in IPsec Child SAs**

In deployment scenarios where (IP) data packets exchanged between a STA and a 3GPP 5G core network traverse an IEEE 802.11 air interface but do not have appropriate DSCP marking from which the required QoS treatment can be mapped at the transmitter, rule-based packet classification and QoS assignment can be performed instead.

When the 3GPP network maps QoS flows to IPsec Child SAs, the SPI value of a Child SA can be used as the packet classifier for a QoS rule. The TCLAS element defined in the IEEE 802.11-2020 standard supports classification based on IPsec SPI. Please refer to subclause 9.4.2.30, Frame classifier type 10 (IP extensions and higher layer parameters). With respect to Figure 9-327, the Protocol Number or Next Header field and Filter Value/Mask fields need to be set appropriately to specify the SPI field, depending on the use of ESP or AH protocol, (IPv4) UDP/TCP encapsulation and/or IPv6 extension headers. Multiple TCLAS elements (together with a TCLAS Processing element, see subclause 9.4.2.32) can be used to specify a classifier comprising both an SPI value and other parameters such as (outer) IP addresses and ports.

The IEEE 802.11-2020 standard defines several capabilities that make use of TCLAS elements for packet classification, notably the Stream Classification Service (SCS) (refer to subclause 11.25.2) and TS operations (refer to subclause 11.4). In both cases, the STA can request the AP to apply rules that, on transmission, assign a specified User Priority (UP) to frames containing IP packets that match the TCLAS element(s) classifier.

In a typical use case where Child SAs carrying downlink traffic do not have appropriate DSCP marking (e.g. because the marking has been removed or modified by intermediate nodes on the public Internet or ISPs), the STA might make such a request at the time the Child SAs are initiated and the corresponding SPI and UP values are known.

For Child SAs carrying uplink traffic, the STA can assign the UP of the corresponding packets autonomously (either directly, or via DSCP marking), so it is assumed no specific exchanges with the AP are required.

In cases where the UP is assigned based on DSCP marking (instead of TCLAS classifier based rules), the mapping table might be configured by the network using the QoS Map capability (see subclause 11.22.9).

If there are any deployment scenarios in which the QoS requirements of traffic flows cannot be represented either by DSCP marking or by TCLAS-based rules, we would appreciate additional information.

**Mapping of 3GPP 5QIs to IEEE 802.11 QoS**

The 3GPP 5QI values are used to indicate QoS requirements in terms of relative priority, GBR/non-GBR, packet delay budget, packet error rate targets, and (in certain cases) a maximum data burst size.

The relative priority associated with 5QI values is directly comparable with the IEEE 802.11 UPs (which are mapped to EDCA access categories).

However, while the relative priority (e.g. UP) of an IP flow is likely to indirectly influence whether or not other parameters associated with a 5QI are met (e.g. packet delay budget), in practice an IEEE 802.11 based network might use various monitoring, queue management and air-interface scheduling techniques to help ensure the target KPIs for QoS flows in the network are met. Capabilities introduced in the IEEE 802.11ax-2021 amendment such as OFDMA, UL MU-MIMO, Spatial Reuse and TWT, provide additional degrees-of-freedom for the scheduler to optimize transmission of traffic flows to meet these KPIs. For example, OFDMA and MU-MIMO increase MAC efficiency and can reduce packet delay by transmitting packets to multiple users within the same TXOP, while Spatial Reuse can reduce packet delay by enabling additional transmit opportunities while managing interference. Certain KPIs such as packet error rate targets are also influenced by rate selection and retransmit behavior.

The TSPEC element (see subclause 9.4.2.29) can be used to explicitly exchange target KPIs between a STA and an AP for a QoS flow. The current design is primarily intended for use with Admission Control for GBR flows such as voice, however discussions are currently ongoing in the TGbe Task Group to enhance this signaling and its optimization for non-GBR flows.