IEEE P802.11
Wireless LANs

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| Liaison response to 3GPP R2-167306 |
| Date: 2016-11-07 |
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Abstract

This document is a proposed response to the liaison from 3GPP RAN R2-167306.

Revision 0: initial version

The 3rd Generation Partnership Project (3GPP) submitted a letter to the IEEE 802.11 Working Group (WG). The letter is documented in IEEE 802.11-16/1384r0.

# Summary of the letter from 3GPP

**1. Overall Description**

As part of the Rel-14 WI on Enhanced LTE-WLAN Aggregation (LWA), 3GPP RAN2 is considering to use the WLAN “Estimated Throughput” where it is reported to the eNB for LWA operation (e.g. activation and deactivation of LWA and data forwarding decisions at the eNB). This metric, which is defined in p802.11-REVmc\_Draft\_6.0, was also mentioned in IEEE response LS to RAN2 (R2-143002 “Follow up liaison response to 3GPP R2-141855”).

RAN2 would like to ask IEEE to provide feedback on whether there are any accuracy requirements for “Estimated Throughput”, its variations across different implementations, and feasibility of calculation by either STA or AP. RAN2 would also like to know if it would be feasible for IEEE to define such requirements, if not already defined, as well as suggest other metrics which can also be useful for LWA operation.

**2. Actions:**

RAN2 would like to ask IEEE to provide feedback on whether there are any accuracy requirements for “Estimated Throughput”, its variations across different implementations, and feasibility of calculation by either STA or AP. RAN2 would also like to know if it would be feasible for IEEE to define such requirements, if not already defined, as well as suggest other metrics which can also be useful for LWA operation.

**3. Date of Next RAN2 Meetings:**

RAN2#96 14th - 18th November 2016 Reno, Nevada, USA

RAN2#97 13th - 17th February 2017 Athens, Greece

# Summary of this reply letter

IEEE 802.11 Working Group developed the following reply letter.

To: 3GPP TSG-RAN WG2 c/o …

CC: Wi-Fi Alliance, RAN2, RAN3

Subject: Response to LS on enhanced LTE-WLAN Aggregation (eLWA)

Date: 2016-xx-xx

Dear …,

IEEE 802.11 Working Group (WG) would like to thank 3GPP TSG-RAN Working Group 2 (RAN2) for its LS regarding the “Estimated Throughput” metric.

IEEE 802.11 WG understands that 3GPP RAN2 is interested in this metric for LWA (LTE-WLAN Aggregation) and eLWA, and that two usages are to be considered:

* Use of this metric in the LWA pre-activation phase, where the eNB collects information from an AP and/or a STA to decide if it wants to activate LWA using the WLAN connection between the AP and the STA. The STA may be unassociated.
* Use of this metric in the LWA post-activation phase, where the eNB collects information from the AP and/or the STA to optimize flow control (control the amount of traffic which is steered to the WLAN link and to the LTE link).

The Estimated Throughput metric defined in IEEE 802.11 REVmc D6.0 is intended to allow external entities to make better quality traffic steering decisions and network selection decisions by being able to predict the throughput that might be obtained through a link with an 802.11 STA [2]. Therefore, in principle, it can be applied to both the pre-activation and post-activation phases of LWA.

When a non-AP STA (client device) generates a MLME-ESTIMATED-THROUGHPUT.confirm primitive, the EstimatedThroughputOutbound parameter contains values indicating the estimated throughput in the downlink direction (from AP to STA) for each Access Category. The latest draft IEEE 802.11 REVmc specification (D8.0) specifies that a STA should determine the values contained in EstimatedThroughputOutbound parameter using the equation found in Annex R.7.

The equation found in Annex R.7 defines the estimated throughput values as a function of the following variables:

* a set of values known, measured or determined by the STA (e.g. RSSI, bandwidth, BA window size)
* a set of values indicated to the STA by its peer in the Estimated Service Parameters element

An AP that supports this feature broadcasts the Estimated Service Parameters element in Beacon frames. This element contains a set of values determined by the AP, most notably the Estimated Air Time Fraction value, which indicates the predicted percentage of time that the AP will allocate for sending data to a new STA joining the BSS.

The method used to determine the Estimated Air Time Fraction is proprietary. The value is designed to allow the AP to encapsulate all the information it knows about the current WLAN environment (e.g. channel utilization, OBSS activity, transmit buffer status) into a single metric that can be utilized by STAs in a consistent way.

Since some of the inputs to the Estimated Throughput calculations are determined in a proprietary manner, absolute accuracy bounds are not defined in IEEE 802.11 REVmc D8.0. Nevertheless, because the calculation of Estimated Throughput metric takes into account a great deal of information about the current WLAN environment and device status, it is expected this metric will provide a more accurate and reliable indication than can be determined from the metrics defined in Rel. 13 (i.e. RSSI and BSS Load fields).

IEEE802.11 would welcome any clarifications on the requirements for WLAN metrics in the specific usage of LWA/eLWA. In particular, while the Estimated Throughput metric can be applied to both pre-activation and post-activation phases of LWA, it is also noted that additional metrics may also be relevant in post-activation phase where historical link quality statistics may be available.

Sincerely,

Adrian Stephens
IEEE 802.11 Working Group Chair

**References:**

1. 11-14-0936-03-000m-liaison-response-followup-to-3gpp-tsg-ran-wg2.doc (https://mentor.ieee.org/802.11/)
2. Draft P802.11REVmc\_D6.0