IEEE P802.11
Wireless LANs

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| Followup liaison response to 3GPP R2-141855 |
| Date: 2014-07-17 |
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Abstract

This document is a followup reply to the liaison from 3GPP RAN R2-141855. Also see IEEE 802.11-14/0890r2 [1] and IEEE 802.11-14/0921r2 [2].

The 3rd Generation Partnership Project (3GPP) had submitted a letter to the IEEE 802.11 Working Group (WG). The letter is documented in IEEE 802.11-14/0519r0, to which the IEEE 802.11 Working Group has responded as in IEEE 802.11-14/0658r6. This document contains recommended followup response text drafted by members of the IEEE 802.11 Task Group mc.

# Summary of the letter from 3GPP

The 3GPP TSG RAN Working Group (WG) 2 created a letter to the IEEE 802.11 WG during the 3GPP TSG-RAN2 Meeting #85bis. The letter reports that “3GPP TSG-RAN WG2 (RAN2) is developing a mechanism for inter-working between 3GPP RATs [Radio Access Technologies] (UMTS and LTE) and WLAN.” To allow for efficient inter-working of IEEE 802.11 WLAN and 3GPP’s radio technologies, the 3GPP RAN WG2 intends to develop mechanisms that provide access network selection and traffic routing. The proposed 3GPP mechanism allows a device to steer traffic from one radio technology to another. The letter highlights that this decision process considers several parameters. Among these parameters, 3GPP TSG RAN WG 2 identified RCPI and RSNI as candidates to observe: “If, for a WLAN AP, the RCPI measured by the terminal is above the RCPI-threshold and/or RSNI measured by the terminal is above the RSNI-threshold (and other conditions are fulfilled), the terminal should steer traffic to the WLAN AP.” 3GPP TSG RAN WG2 further emphasizes “[…] that other metrics than RSNI and RCPI are also considered in this mechanism […]” since the decision making process does not rely on PHY layer based measurements only. Consequently 3GPP TSG RAN WG2 asks the IEEE 802.11 WG about its opinion regarding the usefulness of the RCPI and RSNI values to represent PHY layer conditions.

In their letter, the 3GPP TSG RAN WG2 asks about the applicability of certain measurement functionality in the IEEE Std 802.11. The questions are as follows.

* Question 1: Does IEEE 802.11 WG consider WLAN RCPI a suitable metric of WLAN signal strength such that it can be compared to thresholds as in the above described mechanism?
* Question 2: Does IEEE 802.11 WG consider WLAN RSNI a suitable metric of WLAN signal quality such that it can be compared to thresholds as in the above described mechanism?
* Question 3: Does IEEE 802.11 WG consider any other WLAN signal metric more suitable for the above described mechanism?

# Summary of this reply letter

IEEE 802.11 Task Group mc developed this reply letter for approval by the IEEE 802.11 Working Group.

To: 3GPP TSG-RAN WG2 c/o Mattias.a.bergstrom@ericsson.com

CC: WiFi Alliance, RAN4, RAN5, SA2, RAN

Subject: Liaison on WLAN signal measurements for WLAN/3GPP Radio interworking

Date: 2014-07-17

Dear Mattias,

We would like to thank 3GPP TSG-RAN Working Group (WG) 2 for its letter that we received on 2014-04-14. In its letter 3GPP TSG-RAN WG2 asked the IEEE 802.11 WG the following three questions:

1. Does IEEE 802.11 WG consider WLAN RCPI a suitable metric of WLAN signal strength such that it can be compared to thresholds as in the above described mechanism?
2. Does IEEE 802.11 WG consider WLAN RSNI a suitable metric of WLAN signal quality such that it can be compared to thresholds as in the above described mechanism?
3. Does IEEE 802.11 WG consider any other WLAN signal metric more suitable for the above described mechanism?

We had initially responded to 3GPP in May 2014 as follows.

* Regarding Question 1: We consider the RCPI value as defined in IEEE 802.11™-2012 a metric for signal strength.
* Regarding Question 2: We consider the RSNI value as defined in IEEE 802.11™-2012 a metric for signal quality in downlink direction.
* Regarding Question 3: Understanding that the objective of the mechanism is to select the network that provides the best match to the QoS and/or throughput requirements of the system, the consideration of RSNI/RCPI is not sufficient on its own to efficiently estimate the available throughput and QoS that will be experienced in the IEEE 802.11 WLAN. Other metrics should be taken into account, especially channel bandwidth, operating band, number of spatial streams, BSS load, and WAN metrics, see also the attached Table 1. Comparing only the RSNI/RCPI, as is, to thresholds presents some risks of poor decisions. Ideally, a single parameter, such as estimated available throughput, which combines all of the above parameters, would be determined inside of the WLAN modem and then delivered to the upper layers.

The IEEE 802.11 WG has subsequently had more discussion, and we would like to provide additional information regarding the three questions:

* Updated information regarding question 1: RSSI and RCPI essentially provide the same information. Furthermore, RSSI is mandatory in IEEE 802.11™-2012, while RCPI is optional. We would also like to clarify that RSSI should be measured from Beacon frames for WLAN-3GPP interworking purposes. Please refer to IEEE 802.11-14/0890r2 [1] for further details. Please also note that clarifications on the unit and accuracy of the Beacon RSSI have been made in IEEE 802.11-14/0921r2 [2], which has been accepted by the IEEE 802.11 Task Group mc (Maintenance and Revision). Therefore, we consider the Beacon RSSI value as defined in IEEE 802.11™-2012 and IEEE 802.11-14/0921r2 [2] as a metric for signal strength.
* Updated information regarding question 2: RSNI is not well defined and cannot even be computed in some cases. Furthermore, RSNI does not necessarily reflect the signal quality of the received packet. Please refer to IEEE 802.11-14/0890r2 [1] for further details. Therefore, we consider the RSNI value as defined in IEEE 802.11™-2012 not to be a suitable metric for signal quality in the downlink direction.
* Additional information regating question 3: Estimated available throughput has now been defined at the 802.11 SME interface as specified in IEEE 802.11-14/0792r7 [3], which has been accepted by the IEEE 802.11 Task Group mc (Maintenance and Revision). The value of this parameter is determined inside of the WLAN modem and then delivered to a requesting upper layer entity such as a 3GPP connection manager.

Sincerely,

Adrian Stephens
IEEE 802.11 Working Group Chair

**References:**

1. Youhan Kim, “WLAN-3GPP Interworking Metric,” IEEE 802.11-14/0890r2 (<https://mentor.ieee.org/802.11/dcn/14/11-14-0890-02-000m-metric-for-wlan-3gpp-interworking.ppt>).
2. Youhan Kim, “Clarifications on Beaon RSSI”, IEEE 802.11-14/0921r2, (<https://mentor.ieee.org/802.11/dcn/14/11-14-0921-02-000m-clarifications-on-beaon-rssi.docx>).
3. Matthew Fischer, “CID3309 ESTTHROUGHPUT SAPs”, IEEE 802.11-14/0792r7, (<https://mentor.ieee.org/802.11/dcn/14/11-14-0792-07-000m-cid3309-estthroughput-saps.docx>).