IEEE 802
Local and Metropolitan Area Network Standards Committee

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SUBJECT: Follow-up Liaison Statement Regarding LAA

DATE: 18 May 2015

Dear Dino and Satoshi,

IEEE 802 thanks 3GPP for recent liaisons and looks forward to continuing collaboration on coexistence between 802.11 & LAA

IEEE 802 thanks 3GPP for its participation in recent liaison activities between the two organizations related to coexistence between 802.11 and LAA.

In particular, IEEE 802 would like to thank 3GPP RAN1 for its responses in April 2015 (3GPP R1-152182 and 3GPP R1-152183) to IEEE 802's liaison statements (3GPP R1-151155 per ex-15-0025-00 and ec-15-0026-00) to 3GPP in March 2015.

In addition, IEEE 802 would like to particularly thank Study Item Rapporteur Havish Koorapathy for presentation and discussion of 19-15/0042 at the 802.19 meeting 12 May 2015 in Vancouver.

IEEE 802 notes that there was an agreement (3GPP R1-152413) at the last 3GPP RAN1 meeting in April 2015 to undertake further simulation studies of an access mechanism that in many circumstances appears to operate in a similar manner to IEEE 802.11. In particular, it includes category 4 LBT, with similar timing and exponential back off (albeit with delayed feedback). IEEE 802 believes that this is an extremely positive development and looks forward to reviewing the simulations of this approach.

To continue along this path of collaboration and investigation into coexistence mechanisms, IEEE 802 proposes the following:

Recommendation 13: *It is the technical opinion of IEEE 802 that category 4 LBT provides the best coexistence mechanism for use with 802.11 networks, and hence recommends that it be included as a coexistence mechanism in LAA.*

Recommendation 14: *IEEE 802 encourages 3GPP RAN1 to continue simulations during the Work Item to investigate and validate design decisions before adopting them into the Technical Specification.*

Invitation: *To expand collaboration with 3GPP and other industry stakeholders, IEEE 802 proposes working with 3GPP RAN to plan a one day workshop hosted by IEEE 802 on Thursday 16-July, collocated with the July 2015 IEEE 802 Plenary session.*

The below sections discuss specific items related to these recommendations, and other issues resulting from recent discussions in IEEE 802.

IEEE 802 still has concerns relating to what aspects should be included in simulation studies of the coexistence of LAA with 802.11

IEEE 802 is pleased to note that in response 3GPP RAN1 indicated that its plans for simulation already include or now include:
- Up-link and down-link scenarios
- VoIP traffic scenarios, although they are optional
- Some higher density scenarios
- High load scenarios
- Additional 802.11 features (explicit TxBF, fast link adaption, SGI), although they are optional.

However, IEEE 802 would like to continue to discuss these outstanding issues:

Issue 1: 3GPP RAN1 has not yet responded to IEEE 802's recommendation to consider video traffic scenarios. There are multiple industry predictions that the vast majority of network traffic will be video based within a few years, and today hundreds of millions of unique consumers use real time two-way video calling each month.

Issue 2: IEEE 802 remains interested in understanding coexistence performance under additional high density scenarios, e.g. with 50-200 devices per 802.11 AP, where the impact on mean contention windows and signaling traffic are more significant. These scenarios are typical in environments such as stadiums and dense city areas, which are those where it is likely that IEEE 802.11 and LAA networks will be collocated. The IEEE 802 has included dense scenarios in their work on 802.11ax and believes these would also need to be understood for LAA.

Issue 3: 3GPP RAN1 declined to include 3 and 4 Tx/Rx and 80/160MHz configuration in the simulations on the basis that these features are common to LAA and 802.11 and so do not affect coexistence. IEEE 802 agrees with the justification but is concerned the results simulations underestimate the absolute performance of 802.11 systems.

Issue 4: In addition, IEEE 802 notes that there have been a small number of recent submissions to 3GPP relating to hidden station issues (e.g. 3GPP R1-151816, R1-151047, R1-151106, R1-151123, and R1-151972). These submissions indicate significant potential for coexistence issues between LAA and

802.11 without detection and/or mitigation mechanisms for both 802.11 hidden stations and LAA hidden stations. IEEE 802 looks forward to further discussion of this issue at the proposed workshop.

IEEE 802 acknowledges 3GPP RAN1's responses related to simulation study metrics

IEEE 802 acknowledges 3GPP RAN's responses that it has already specified an aggregate performance measure and that 3GPP RAN1 believes there is no need for an airtime consumption metric. IEEE 802 may provide further input on the question of an airtime consumption metric at some future time.

IEEE 802 looks forward to further discussion with 3GPP on issues related to fairness

The 3GPP RAN1 response noted that its working definition of fairness is that there "*is no impact on a first 802.11 network when a second 802.11 network changes to an LAA network using the metrics of user perceived throughput and latency*". 3GPP RAN1 also noted it was using buffer occupancy as fairness metric. Finally 3GPP RAN1 noted that it was deferring IEEE 802's questions related to fairness to 3GPP RAN.

IEEE 802 acknowledges 3GPP RAN1's working definition of fairness. IEEE 802 is still concerned that the fairness is a difficult concept to define in all circumstances. For example, this definition only accounts for two operator networks in a given location. IEEE 802 looks forward to further responses on this topic from 3GPP RAN. In addition, IEEE 802 would like to discuss this topic in the workshop proposed in the Invitation above.

IEEE 802 looks forward to further discussions with 3GPP on how to engage all stakeholders in the review and development of LAA coexistence mechanisms

The 3GPP RAN1 response noted that it was deferring IEEE 802's questions related to the inclusion of other stakeholders into the LAA development and review process to 3GPP RAN.

IEEE 802 proposes expanded collaboration with 3GPP and other industry stakeholders, by working with 3GPP RAN to plan a one day workshop hosted by IEEE 802 on Thursday 16 July, collocated with the July 2015 the IEEE 802 Plenary session at the Hilton Waikoloa Village in Hawaii. To facilitate understanding the potential spectrum sharing issues for operation of IEEE 802.11 and LAA, IEEE 802 suggests some topics for discussion:

- TR 36.889, including proposed channel access parameters
- Working definitions of "fair" coexistence
- Appropriate metrics for measuring coexistence "fairness"
- Further discussion of the hidden node problem in spectrum shared by 802.11 and LAA

IEEE 802 welcomes 3GPP's suggestions for additional topics.

Since time is short, exchange of liaison statements is not a suitable means for advance planning. Therefore, IEEE 802 designates Paul Nikolich, IEEE 802 chair, <email: paul.nikolich@att.net> as the point of contact for planning the workshop. Feel free to contact Paul Nikolich for any technical, programmatic, or logistical issues.

IEEE 802 looks forward to further responses from 3GPP RAN related to engagement of the other stakeholders in the review and development of LAA coexistence mechanisms.

Regards,

/s/ Paul Nikolich
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