IEEE 802
Local and Metropolitan Area Network Standards Committee

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SUBJECT: Liaison Statement Regarding LAA/802.11 Coexistence

DATE: 13 March 2015

Dear Dino and Satoshi,

IEEE 802 thanks 3GPP for recent liaison collaborations

IEEE 802 thanks 3GPP for its participation in recent liaison activities between the two organizations related to the work on LAA by 3GPP. IEEE 802 particularly thanks Dino Flore, the Chairman of 3GPP TSG-RAN, for his presentation to IEEE 802.19 WG in January 2015. The presentation was very helpful in educating IEEE 802 participants about LAA's progress in 3GPP and 3GPP's plans for the future.

While the recent collaborations are encouraging, IEEE 802 is still concerned about many aspects of LAA. At a high level, IEEE 802's concerns are similar to those expressed by Wi-Fi Alliance in their recent position statement (http://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-statement-on-license-assisted-access-laa).

The rest of this liaison statement contains recommendations to provide for effective coexistence between LAA and 802.11 systems in the future.

IEEE 802 recommends to 3GPP that simulations representing more realistic usage scenarios are completed before drawing any conclusions

IEEE 802 recognizes that 3GPP responded on 11 March 2015 (in RP-150454) to a previous liaison. IEEE 802 thanks 3GPP for the response and will provide a more detailed response in the future. Additional recommendations for simulation parameters are listed below:

Recommendation 1: *Consider both uplink and downlink 802.11 traffic in coexistence simulations*

Recommendation 2: *Consider delay intolerant traffic and video distribution as mandatory traffic models and evaluate corresponding performance metrics*

Recommendation 3: *Consider a wide range of load and device densities in coexistence simulations, up to the level seen in many stadium environments; 50 to 200 devices per 802.11 AP radio is a reasonable starting point*

Recommendation 4: *Consider the net change in aggregate performance of all stations in addition to per station performance*

Recommendation 5: *Consider both airtime consumption and throughput as performance metrics*

Recommendation 6: *Include additional features found in 802.11ac implementations (explicit transmit beamforming, fast link adaptation, short guard interval, 3x3 and 4x4 APs and 80/160MHz channels) in simulations*

IEEE 802 recommends to 3GPP that LAA and 802.11 always have equal access to the wireless medium

CSAT, as defined by the LTE-U Forum, is an example of a coexistence mechanism designed to allow LTE systems to operate in unlicensed spectrum. It appears to allow an LTE-U system to statically or dynamically define the proportion of a cycle allocated to LTE-U operation and therefore the proportion allocated to 802.11 or other systems.

The power to make this decision gives LTE-U control over the unlicensed medium and potentially preference for LTE-U systems over 802.11 systems, which is clearly unacceptable for a community resource (unlicensed spectrum) that is supposed to be shared without preference.

Recommendation 7: *Any sharing scheme must treat all LAA & 802.11 devices as equals in any decisions about medium access*

IEEE 802 recommends to 3GPP that LAA medium sharing algorithms are non-proprietary

CSAT is an example of a coexistence mechanism that appears to allow the algorithms controlling access to the medium to be proprietary. This means that any imperfections in the algorithms or any biases toward LTE-U over 802.11 built into the system will be secret and thus unreviewable. This approach only increases the concern for the level of control that LTE-U systems could assert over 802.11 in terms of access to the unlicensed medium. IEEE 802 believes it is important that LAA medium sharing algorithms avoid a similar problem by being public, standardized and accepted by all relevant stakeholders.

Recommendation 8: *LAA medium sharing algorithms must be non-proprietary*

IEEE 802 recommends to 3GPP that all LAA medium sharing algorithms respond quickly to changing conditions

CSAT is an example of a coexistence mechanism that appears to allow medium sharing to be relatively static. This means that a sharing decision made in the past may no longer represent reasonable sharing

in the present, causing unfairness and inefficiency. IEEE 802 believes it is important that LAA medium sharing algorithms avoid a similar problem by being designed to dynamically respond to the changing needs of all users.

Recommendation 9: *LAA medium sharing algorithms must be designed to dynamically respond to the changing needs of all users*

IEEE 802 recommends 3GPP provide a clarification on the definition of fairness

3GPP have a definition of fairness whereby a group of 802.11 systems have no worse performance when one of them is replaced by an LAA system.

Suppose an LAA system with 10 clients and an 802.11 system with 10 clients shared the medium. Further suppose that the LAA traffic is downlink only and the 802.11 traffic is uplink only. Fair sharing principles, derived from what would happen if both systems were 802.11, means the LAA base station should have 1/11th of the bandwidth and the ten 802.11 clients should have 10/11th of the bandwidth.

However, some people might believe that fair access means the LAA base station should have half of the bandwidth and the 802.11 clients should have half of the bandwidth. It is important that there is a commonly agreed definition of fairness in a rich set of use scenarios to allow full evaluation of any LAA proposals.

Recommendation 10: *An agreement between 3GPP and IEEE 802 is needed on what fairness means in a range of realistic usage scenarios*

An alternative approach to defining fairness is to follow the historic approach of the Wi-Fi industry that avoids any need to agree on a definition of fairness, which is a complex undertaking. Instead, the Wi-Fi industry has agreed on an access method (CSMA/CA from 802.11) that is assumed by all to achieve fairness. In the context of LAA, this would mean that 3GPP and other stakeholders would need to agree on one or more access mechanisms that are deemed to be fair.

The benefit of this approach is that fast agreement is likely, especially if 3GPP adopts an access mechanism similar to 802.11, with LBT and some sort of exponential back off mechanism.

Desirable alternative 10.1: *An agreement between 3GPP and IEEE 802 is needed on one or more acceptable access mechanisms*

IEEE 802 recommends identification of any reasonable scenarios in which LAA is not fair

It is not possible to simulate all possible problematic use cases. One method to address this issue is to challenge all stakeholders to identify any reasonable use cases in which LAA is not "fair".

Recommendation 11: *Submitters of simulation results should be encouraged to identify any reasonable use scenarios in which LAA is not "fair"*

IEEE 802 recommends to 3GPP that they make a concerted effort to consider the views of all stakeholders

There is a concern that the views of some important stakeholders are not being properly represented in 3GPP. This is the case with many IEEE 802 participants who do not traditionally participate in 3GPP and may be unfamiliar with its culture and processes.

Recommendation 12: *3GPP should include steps in their development and review process for LAA that require the views of important stakeholders, such as IEEE 802 participants, to be fully considered*

IEEE 802 suggests that 3GPP facilitate a joint collaborative activity with IEEE 802 and other stakeholders. IEEE 802 requests 3GPP to suggest appropriate mechanisms for expanded collaboration, perhaps beginning with a joint 3GPP/IEEE 802 workshop in the near future.

Regards,

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