

Cisco/UDel Meeting Minutes
February 11, 2016

Attendees: Jim Seymour, Len Cimini, Chien-Chung Shen, Li Li
Minutes Taken By: Li Li

Slides #4-12 – Review & Discussion: delay versus load ratio

- Li: For median and 75-percentile values, WiFi and LAA have very different performance trends. The reasons are: 1) Due to SNR threshold (the SNR thresholds are 20 and 17.5 dB for WiFi and LAA, respectively), WiFi #3 will suffer from performance loss first in CDF curves; 3) Considering that there are more interference for LAA (WiFi will block WiFi since preamble decoding is used) in bad locations, LAA will get an even worse performance at a later time in CDF curves.
- Li: The performance of delay is even better at -75 dBm compared to -65 and -70 dBm. This is because low ED means the transmitting opportunity for LAA decreases, but collision probability for LAA also decreases. For example, there are no collisions among LAA #2 and LAA #4.

Slides #13-15 – Review & Discussion: performance with different threshold.

- Jim: At the case of “-65, -75, -75, -65” dBm, it achieves the best aggregate performance, but also with worst fairness. For fairness, we may need to compare with a pure WiFi network. It is still interesting to see how the CDF curves look when you have all WiFi nodes.

Slides #17-20 – Results with multiple users

- Jim: Why a mixed WiFi/LAA network is much better than a pure WiFi network?
- Li: I will talk about the results from other companies at a later time. For my results, I think the main reason is that an ideal scheduling is assumed, so there is no competition among LAA users.
- Jim/Chien-chung: How do you decide when to start and when to stop transmitting for LAA?
- Li: I am assuming that one user will wait for other users so that all users have data to transmit after this waiting time.
- Jim: I can see the benefits of LAA, but the performance improvement is too huge. Maybe we also need to take a look at the performance of latency. One more thing is that, we may need to consider the case that each UE grabs the whole 20 MHz channel one by one, and then each user can get data through much faster, which is typical in 5 GHz.
- Jim: Maybe we can think about to do proportional scheduling to TxOP time. For example, if UE #1's LBT procedure is finished, but UE #1 is in a bad location; and at this time, UE #2's LBT procedure is not finished, and UE #2 is in a good location. Maybe we can transmit data for UE #2 first in this case.

Slide #24 -26 – Results from NS-3, LAA is worse than WiFi.

Slide # 27 – Results from Intel.

- Jim: In Step 2 at -72 dBm, when we add the throughput of WiFi downlink and uplink, it is close to the throughput of LAA. Also, the throughput of WiFi in Step 2 is close to that of WiFi in Step 1, so the introducing of LAA in this case does not hurt the original WiFi.

Actions Items:

- **Improve the simulation with a limitation of TxOP.**
- **Simulate another case: each UE grabs the whole 20 MHz channel one by one.**

Next meeting: Thursday February 25 2:30 - 3:30pm (EST)