Cisco/UDel Meeting Minutes
January 15, 2016

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

Slides #11 – Results for the case of 4 pairs: 2 APs with 2 clients, and 2 eNBs with 2 users

- Jim: What are the differences between this case and the cases shown in the previous slides?
- Li: In the previous results, I assume that a user is in a particular location so that one AP's transmission will interfere with the user's reception, but one LAA's transmission will not interfere with a client's reception. In the following slides, I assume there is one user/client for each AP/eNB, and I randomly drop the users/clients to evaluate the "average" performance.
- Jim: In some results, some bad locations/droppings are excluded, maybe we should not exclude them, and it should be counted in evaluating the performance of a particular AP/eNB.
- Li: Yes, to show the performance of "average" delay, I exclude some bad locations, otherwise, the value will be infinite.

Slides #15 – Delay vs. Load ratio

- Len: You should put the figures with different LAA ED in one slide so that people can easily do comparison and see the difference. Again, the average cannot provide you too much information. The CDF curves, and these curves (delay vs. load ratio) show some details.
- Len: Why the delay of WiFi #3 with LAA ED of -65 dBm is larger than that of LAA ED of -70 dBm. Does a higher threshold mean that fewer users can access the channel, and then the delay should be smaller at -65 dBm?
- Jim/Chien-Chung: A higher threshold means that more users can access the channel, since a lower threshold means that LAA is more sensitive to noise/interference and will back off more frequently.
- Len: You should put some conclusions at the bottom.

Slides #20 – Results for the case of 8 pairs, at the load ratio of 0.5.

- Chien-Chung: In the middle table, you exclude some bad locations, what about the first table? What's the meaning of excluding bad locations?
- Li: In the first table, every dropping is included in computing the average percentage of time occupation. When I compute the average value, there may exist some droppings that make the percentage of time occupation of one pair equal to zero, which means the associated delay is an infinite value. Then, I think it is a bad dropping, so that when computing the average percentage of time occupation/delay, I do not count this dropping in the second/third table. Otherwise, the average delay will be infinite.

Slides #21 – Results for the case: different eNBs with different thresholds.

- Jim: The second row seems to be more equal across different pairs than the third row, which means it is fair to each pair even though the overall performance of WiFi and LAA are both worse than that of the third row. For example, in the 2nd row, only WiFi #5 suffers, and other pairs are all around 0.2. We should also consider about the fairness.

Slides #22 – A simple adaptive algorithm.

- Jim: Do you allow enough time for a given dropping to converge to a stable state?
- Li: I updated the threshold every 1 second, and drop the users every 150 seconds. I will take a look at the simulation to see whether the algorithm converges.
- Chien-Chung: When we update the energy detection threshold, is the threshold value continuous, or discrete with a finite set of values?
- Jim: I think we can at least update the ED threshold at a step of 1 dB.

Slides #25 – Results for the case of multiple users.

- Jim: Even at -65 dBm, WiFi is better than LAA, it is different from the previous conclusions.
- Li: I simulate WiFi with multi-user beamforming.
- Jim: WiFi supports multi-user beamforming, and LTE can also do this. When we do comparison, we should use the same technology for both WiFi and LAA. Thus, maybe we should not employ multi-user beamforming for WiFi here.

Actions Items:

- **Continue to study adaptive algorithms.**
- **Continue the simulation for the case with multiple users.**

Next meeting: Friday January 29 2:00 - 3:00pm (EST)