Cisco/UDel Meeting Minutes
December 17, 2015

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

Slides #9 – Measured delay for each successful transmission (original definition)

- Len: It is not a CDF, and it only shows that the delay for WiFi is much larger than that for LAA. Why does the delay of WiFi increase linearly?
- Li: This is the original definition. First of all, the load rate is very high, and it is 0.8. At -65 dBm, LAA has more chances to occupy the channel and the number of packets in the buffer is always a small value. But for WiFi, it cannot always send its data out, which means the number of packets in the buffer keeps increasing. Thus, the delay for WiFi keeps increasing at -65 dBm. The conclusions will be different when LAA ED equals to -75 dBm.

Slides #10 – CDF results for delay at -65 dBm.

- Jim: The delay for WiFi is really large, which means that the channel is over loaded. We may need to consider lower load rate. Do you have the curves for different load rates and thresholds?
- Li: I have the results of the load rate of 0.5, but it is not plotted as a CDF yet. And I do not have CDF curves for other thresholds.
- Len: We need these curves for different load rates and thresholds in the same plot.

Slides #12 – Results for delay with new definition.

- Len: This definition still does not make too much sense to me. It is the measured delay over the air, and everything should be counted.
- Chien-Chung: It's not the delay over the air. It is the delay excluding the queuing delay.
- Li: We can see only a small number of successful transmission. If we plot CDF, the CDF may not present this information.
- Len: One way may be not sufficient, but we should not exclude it. CDF gives us a lot of information. We may need to combine different ways together to show the performance, and throughput can also be included.

Slides #14 – The new definition may be a better definition together with the throughput, or the number of successful transmissions.

- Jim: For low load rate cases, the old definition may be fine, too.
- Len: We can also plot the delay, for example, the 90^{th} percentile delay, as a function of the load rate.

Slides # 17 – Average percentage of time occupation for each random dropping at -70 dBm.

- Jim: There is a discontinuity around 60 for WiFi #1, from a low value to a big value, why?
- Li: For the first 30 droppings, the user is in a really bad location, and the packages cannot be send out successfully at all; from 30 to 60, the users are in a bad but not so bad location, only a few of packages are transmitted successfully. Also, I only consider one MCS here. If I include more users and more MCS, it may be not like this.

Slides # 22 – Results for the case of multiple users.

- Jim: In multi-user MIMO, are you assuming clients can be separated completely?
- Li: Yes, I made an assumption here.
- Jim: The results for 802.11ac with MU-MIMO is only slightly better than the case without MU-MIMO, and I think there should be a significant gain.
- Li: Here, I assume the load rate is 0.8 at AP, which means that the average load rate for each user is only 0.16. If I assume all users have a load rate of 0.8, the performance gain will be significant for MU-MIMO case. Should I simulate in this way, or should I increase the load rate for the MU-MIMO case?
- Jim: In general, the load rate of 0.8, which we begin with, it too high. Maybe we need to simulate lower load rate so that the buffer will not keep increasing. Then, when we increase to a higher load rate, the MU-MIMO technique will have some advantages.
- Li: In LAA case, I assume there is no competition among LAA users belonging to one eNB, since we can use frequency multiplexing, like OFDMA.

Slides # 23 – I should make some changes to my simulations, so that I can record delay even when multiple users having different MCS.

Actions Items:

- **Translate current results of CDF curves.**
- **Simulate all cases with a lower load rate.**
- **Continue the simulation for the case with multiple users.**

Next meeting: Friday January 15 1:00 - 2:00pm (EST)