

Cisco/UDel Meeting Minutes
October 16, 2015

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

Slides #4 – In 3GPP file, for small cells, sigma for shadowing is 10 if UE is inside a different building or outside; and it is 3 (4) for LOS (NLOS) case if UE is inside the same building as the base station.

- Len: According to previous experiences, sigma should be larger in a more clutter environment. So I may use 10 for indoor case.
- Jim: I think it is true for Rayleigh fading, and sigma will be larger for indoor case. But for Shadowing, sigma may be higher for outdoor case due to reflections caused by large objects. I have seen a lot of models using low sigma, like 4, in indoor simulations.

Slides #5, – Tables for “Radius” and “Block times” with different LAA CCA thresholds.

- Jim: In the upper two tables, the block times for WiFi are 2,3,3,2 from the left table; but in the bottom two tables, the block times for LAA are still 2,3,3,2 and not 3,5,5,3. Do you need to exchange the two columns in the right table?
- Li: The left table means that when one node is transmitting, some nodes will be blocked; the right table means the number of times that one node is blocked by others. For example, for Pair #4, when any of Pair # 1,2,3,5,6 is transmitting, # 4 will be blocked. So, the “block times” is 5 in total.
- Len & Chien-Chung: Find a better way to present it, and maybe you can circle “4” in your left table in this example so that it can be explained more clearly.

Slide #7, – The number of times that each node is blocked is shown in the top table, and the percentage of time occupation is shown in the bottom table.

- Jim: What’s the difference for these two tables?
- Li: The top table is the number of block times. For example, at -60 dBm, WiFi #1 is blocked 14217 times due to others’ transmission in the top table, and WiFi #1’ percentage of time occupation is 0.3323.
- Jim & Chien-Chung: Is the bottom table the rate?
- Li: It is the percentage of time occupation for successful transmission. We can see that, the block time for LAA is increasing as shown in the top table, and its percentage of time occupation is decreasing in the bottom table.
- Jim: I try to understand why WiFi’s performance keeps the same when LAA’s performance is decreasing.
- Li: Yes, for this simulation, the load rate is 0.5. The percentage of time occupation for WiFi will be around 0.33 even without LAA. It means WiFi can always send their data out.
- Jim: In your results for throughput, it seems that there is no impact of WiFi’s transmissions. Maybe you can show the latency of each pairs’ transmission, then you will see the impacts of decreasing LAA threshold.

Slide #9, – Simulation results for load rate of 0.8. It is a bit strange that some WiFi pairs' performance will decrease first and then increase.

- Len & Chien-Chung & Jim: What does this mean? Why WiFi performs better at high thresholds, and then decreases, and then become better again. The results do not match what we expect to see.
- Jim: When decreasing the LAA threshold, LAA backs off more; this give WiFi more opportunities to transmit, and it does not make sense that it will decrease first.
- Len: WiFi's performance is not improved much even when LAA's performance is getting much worse.
- Li: We can see WiFi's performance is going up in general (a small going up). I did another simulation, I assume there are only four WiFi pairs (no LAA pairs), the performance is also like this. So, it is kind of an upper bound, and WiFi's performance are limited by other WiFi's transmissions in this case.
- Jim & Len: Okay. This explains question 1: why WiFi does not go up too much. Then, how about question 2: why WiFi will go down?
- Li: I am not sure and only have a guess so far. Decreasing LAA thresholds will decrease the opportunities of concurrent transmissions; this may both decrease WiFi and LAA's performance?
- Len: How can we test whether it is real or not?
- Jim: For -70 dBm, both WiFi and LAA back off more, it is strange and we may need to see why this happen.
- Chien-Chung: No, they are not consistent. Block times of some WiFi pairs increase and block times of some other WiFi pairs decrease at -70 dBm compared to -65 dBm.
- Jim: Does this mean that some WiFi pairs will block other WiFi pairs when decreasing LAA threshold? It is kind of weird.

Slide #12, #13, #14 - Simulation results for multi-carrier LBT with some legacy nodes.

- Chien-Chung: Why do you consider 802.11b instead of 802.11a, 802.11b works on 2.4 GHz band?
- Li: I made a mistake here, I thought 802.11b works on 5 GHz band, and I should use 802.11a/n instead.
- Jim: What does primary channel for LAA mean?
- Li: It is a WiFi-like multicarrier LBT, so LAA will also choose one subchannel as its primary channel. In this case, LAA do the same as WiFi.

Actions Items:

- **Explain why WiFi's performance may decrease sometimes.**
- **Consider to measure latency for different thresholds.**

Next meeting: Friday October 30 1:30 - 2: 30pm (EDT)