

**3GPP TSG RAN#93e**

12<sup>th</sup>-13<sup>th</sup> September 2021

**RP-212318**

Agenda Item 9.0.3

# DC/CA Enhancements

**MediaTek Inc.**

# DC/CA Enhancements

## RAN1-led

Efficient spectrum utilization with robust user experience.  
Address capacity shortage due to LL eMBB (XR, CG).

**Objective I: Enhancement of latency-constrained capacity for inter-band CA with TDD [RAN1, 2, (4)]**

- Cross-carrier HARQ retransmission and cross-carrier HARQ feedback (leftover(s) from R17 eURLLC if any)

**Objective II: Full scheduling flexibility for massive carrier aggregation under limited UE blind decoding complexity [RAN1, 4]**

- Scalable cross-carrier scheduling with 2-stage control (i.e. all scheduling info for 2<sup>nd</sup> cell provided in 2<sup>nd</sup> stage)

3GPP TUs (Total w/ 9 meetings)			
RAN1	RAN2	RAN3	RAN4
15	2	0	4.5

SA/CT Dependency: No

# Cross-Carrier HARQ Enhancements

- Latency-constrained capacity in FR1 is dominated by TDD pattern

- For low-latency eMBB, latency-constrained capacity with one single carrier can be limited under practical TDD patterns

N41 (2.6 GHz, CC0) : DDDDDDSUU

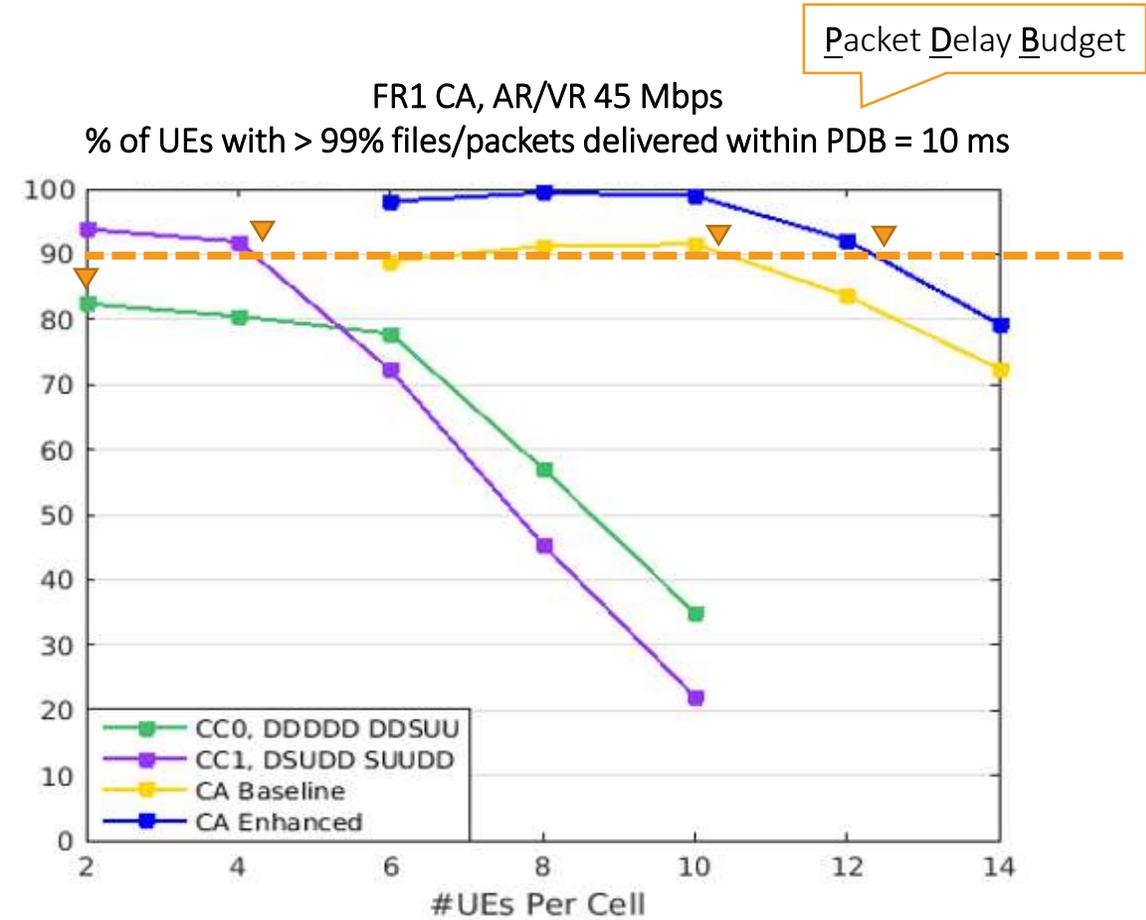
N79 (4.9 GHz, CC1) : DSUDDSUUDD

- CA is helpful for capacity but there is **space for 20% or higher capacity improvement**

- Increase 10-ms constrained capacity from 6-10 to 12

- Suggested R18 Enhancement for FR1 CA

- Cross-carrier HARQ enhancement for **reduced HARQ round-trip latency** and improved latency constrained capacity for low-latency eMBB

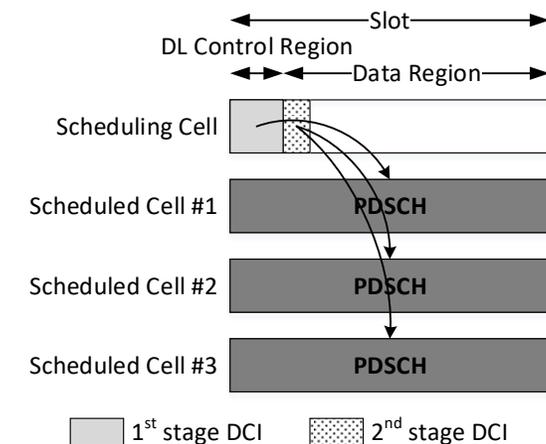
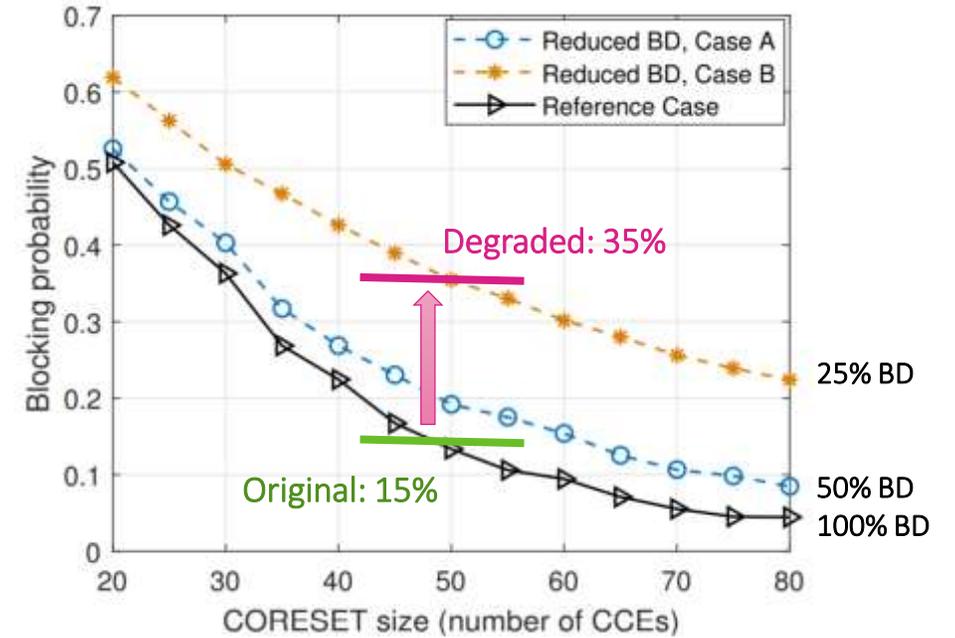


Latency-Constrained Capacity (PDB = 10 ms)				
Carrier Configuration	CC0	CC1	CC0 + CC1 R17	CC0 + CC1 R18
Average #UEs per cell @90% UE satisfaction	<2	4	6 - 10	12

# Multi-Carrier Scheduling Enh

- When aggregating more FR2 CCs (up to 16 CCs), UE can report limited support of Blind Decoding (BD) complexity of 4 CCs
  - The blocking probability can increase from 15% to 35% due to limited BD budget
  - Conflict between network CA scheduling flexibility and UE CA complexity
- Suggested R18 Enhancement for FR2 CA
  - Enhancement of multi-carrier scheduling to allow
    - UE blind decoding complexity of one single CC
    - Network full scheduling flexibility for multiple CCs
  - Based on a **two-stage approach**, left figure illustrates an example where 1-CC blind decoding can accommodate scheduling of 4 CCs

Source: M. Mozaffari, Y.-P. Eric Wang, K. Kittichokechai, "Blocking Probability Analysis for 5G New Radio (NR) Physical Downlink Control Channel," 2020



**Thank You!**