

3GPP TSG RAN Rel-18 workshop
Electronic Meeting, June 28 - July 2, 2021

RWS-210056

Agenda Item: 4.1
Source: Spreadtrum Communications
Title: R18 UL improvement
Document for: Discussion and decision



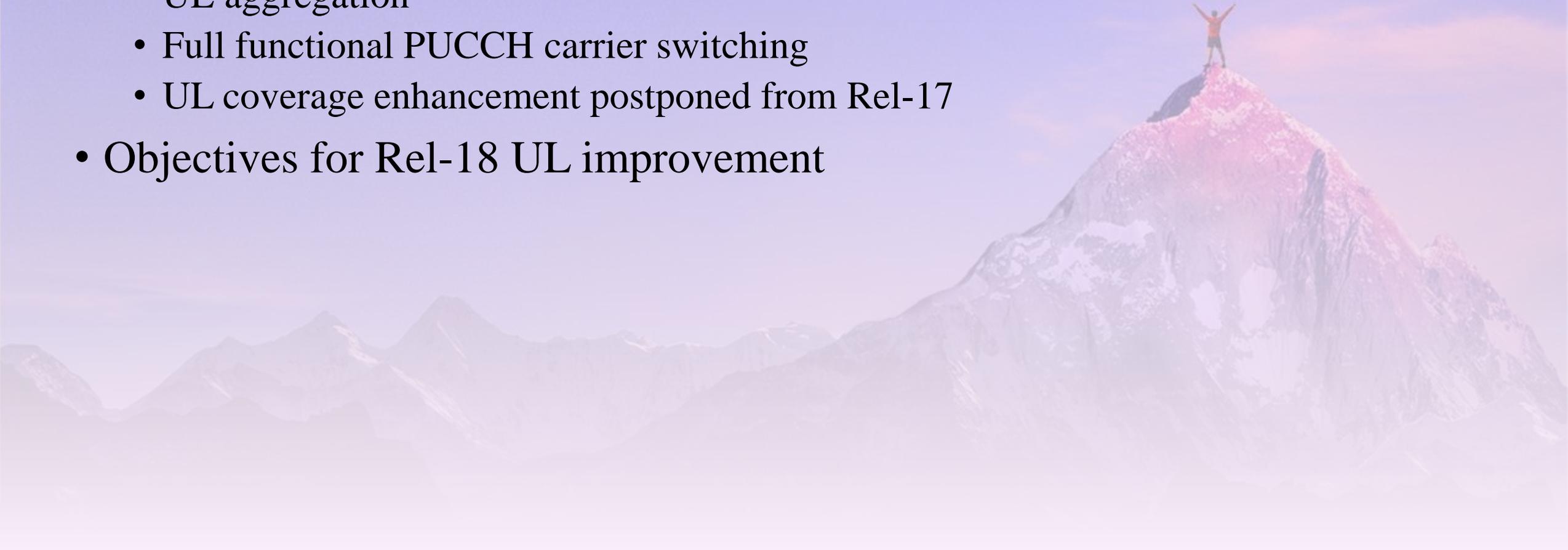
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Contents

- Justifications for UL improvements
 - UL carrier switching
 - UE aggregation
 - Full functional PUCCH carrier switching
 - UL coverage enhancement postponed from Rel-17
- Objectives for Rel-18 UL improvement



UL improvement- UL carrier switching

- Observation:

- Less UL Cells compared with DL Cells

- Limited UE RF transmission capability
 - Limited UE power

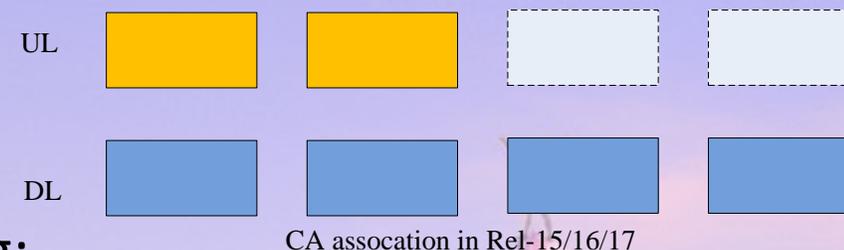
- support UL carrier switching between/among:

- SUL and UL
 - SRS carrier and PUSCH carrier

- Higher requirement of UL traffic, including data rate, latency, reliability

- New use cases, e.g.

- XR [S4aV200640]
 - Broadband access in a crowd [22.261]

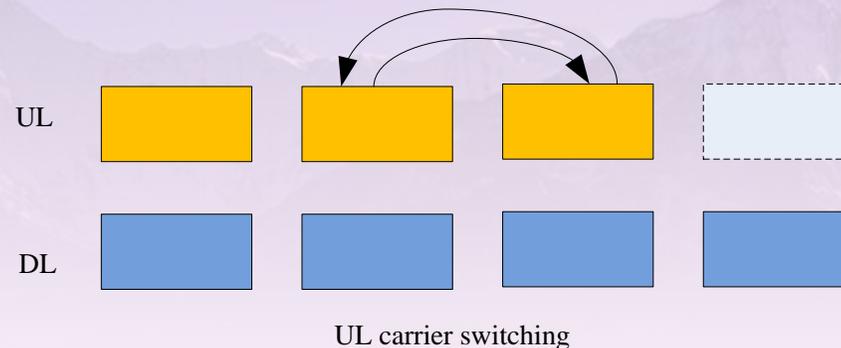


Media	Format and Model	E2E Latency requirement
Video + Depth	1080p, Capped VBR 10/20 Mbit/s for UL	Conversational 100ms, 200ms

Scenario	Experienced data rate (DL)	Experienced data rate (UL)	Area traffic capacity (DL)	Area traffic capacity (UL)	Overall user density	Activity factor	UE speed	Coverage
Broadband access in a crowd	25 Mbit/s	50 Mbit/s	[3,75] Tbit/s/km ²	[7,5] Tbit/s/km ²	[500 000]/km ²	30 %	Pedestrians	Confined area

UL improvement- UL carrier switching

- UL carrier switching between/among PUSCH carriers:
 - Keep less UL Cells compared with DL Cells
 - No impact on UE RF transmission capability
 - No impact on the limited UE power
- Benefits
 - Dynamic switching UL Tx from one carrier to another, based on
 - UE density, CSI measurement, beam management, and traffic priority.



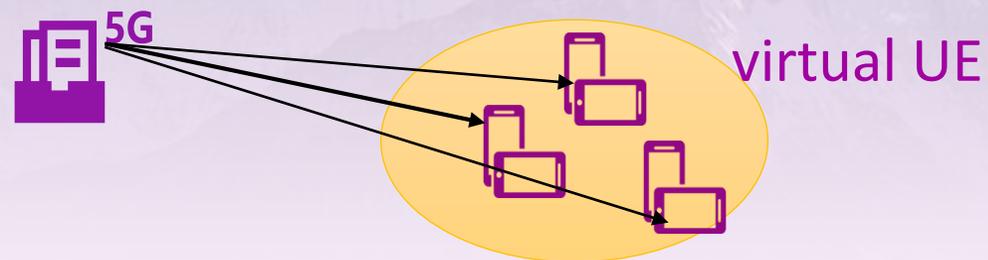
UL improvement- UE aggregation

- Observation:
 - Less UL Tx capability compared with gNB
 - Limited UE RF transmission capability
 - Limited UE power
 - Support PC5 communication in addition to Uu
 - One terminal associated with many UEs
 - E.g. cellphone, laptop, watch, glasses, helmet etc.
 - Higher requirement of UL traffic, including data rate, latency, reliability
 - New use cases, e.g. XR, Broadband access in a crowd [22.261]



UL improvement- UE aggregation

- UE aggregation:
 - A group of UEs treated as one virtual UE
 - For one UE, still keep less UL capability,
 - no impact on one UE RF transmission capability
 - No impact on one UE's the limited power
 - For the virtual UE can enjoy
 - larger UL bandwidth
 - Dynamic choice of RF chains, with better Tx beam, flexible scheduling time and frequency resource



UL improvement- PUCCH carrier switching

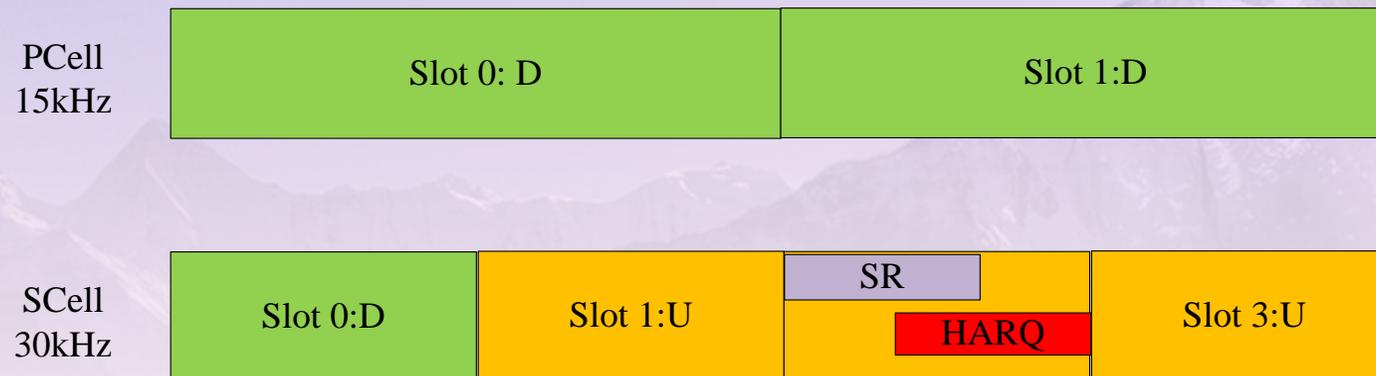
- Observation:

- Rel-17 support PUCCH carrier switching for HARQ feedback only
 - Not support SR and CSI on PUCCH
- For SR and CSI report
 - Due to TDD configuration, SR and CSI on PUCCH is dropped on some transmission occasions
 - Some CSI reports are dropped because of limited resources of PUCCH
- Reduce the latency of SR and CSI report is good for system performance



UL improvement- PUCCH carrier switching

- Full functional PUCCH carrier switching:
 - In addition to HARQ-ACK PUCCH carrier switching, SR and CSI PUCCH support carrier switching
 - Adopt RRC configured PUCCH carrier switching pattern for SR and CSI only
 - Reuse the Rel-17 PUCCH carrier switching mechanism as much as possible



UL improvement- UL coverage enhancement

- Observation:
 - Rel-17 coverage enhancement
 - PUSCH/PUCCH/Msg3 PUSCH
 - Due to limited time, there are still several dB gap for PUSCH and PUCCH, E.g. rural area
- UL coverage enhancement postponed from Rel-17
 - PUSCH repetition type B
 - Sequence based PUCCH
 - Others, can be checked at the end of 2021

Objectives for Rel-18 UL improvement

- Support UL carrier switching of PUSCH carriers
 - Configuration and Indication of UL carrier switching
 - Impact of PUSCH processing time
 - Study the feasibility and benefit of solution(s) on the UE aggregation for enhanced UL transmission, and specify the identified solutions if deemed feasible and beneficial
 - Support full functional PUCCH carrier switching
 - SR or/and CSI only PUCCH carrier switching
 - Considering the interaction of HARQ-ACK PUCCH carrier switching
 - UL coverage enhancement postponed from Rel-17
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Thank you

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